A McGRAW-HILL PUBLICATION

TECHNOLOGY DEPARTMENT

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Construction Methods

Hydraulic Bank Caving on the Mississippi River

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT

General Construction · Highways · Buildings · Engineering · Industrial

Drive Sheet Piling 2' to 9' per min.

Speed, the first essential in handling excavation jobs, must be maintained at all times regardless of the nature and condition of the ground. When the contractor is working in sand, clay, or broken ground,—in fact, wherever piling is necessary,—speed can be secured only through the use of pile hammers.

The Ingersoll-Rand CC-45 Pile Hammer will drive 2″ sheet piling at the rate of 2′ to 9′ per min. It weighs but 128 pounds, and has demonstrated that it can do the work of 8 to 12 men driving by hand.

Ingersoll-Rand Company also manufactures a heavier, more-powerful hammer for 3″ piling. It is called the R-30, and weighs 148 pounds. Request form 4078.

INGERSOLL-RAND CO., 11 Broadway, New York City
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Ingersoll-Rand

12-PB

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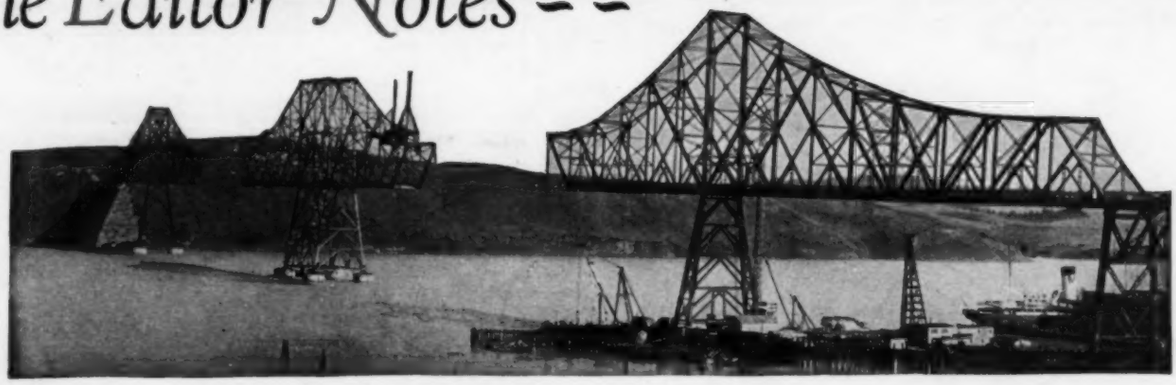
TECHNOLOGY DEPT.

The Editor Notes - -



To Start Business on the Upgrade

THE approach of winter makes it highly desirable that every influence be brought to bear to minimize unemployment and start business on the upgrade *now*. The real issue is whether current low levels are to continue or whether they can be raised sufficiently for the year 1931 to begin on a normal basis. A recent conference of the editors of the McGraw-Hill publications, covering a wide range of engineering and industrial fields, developed a number of general ideas and certain specific suggestions for the relief of present conditions by immediate action. While it relates to business generally, rather than to any one of its many subdivisions, the following summary of the points brought out in the discussion may suggest to engineers and contractors, as well as to the manufacturers and distributors of construction equipment and materials, thoughts that may be applied advantageously to their own operations in the interest of speeding up a general business recovery:

1. *Production*—Favorable time to modernize plant; prices low; labor efficient and not likely to be cheaper; improvements will not interfere with production; will prepare for competition later; get more for dollar now than for some years past.
2. *Research*—Redesign or otherwise improve the product; consider new products; study customers' needs.
3. *Labor*—Maintain wage levels; if necessary, stagger employment for part-time work; stabilize production programs; avert unsound labor legislation by sound production and employment policies.
4. *Merchandising*—Stop selling at a loss; keep adequate stocks on hand.
5. *Finance*—Credit resources are abundant; long-time borrowing is sound for raw materials, modernization, preparing for competition and reducing costs.
6. *Purchasing*—Make advance purchase of raw materials; prices not likely to decline further; purchase for stock and for future manufacture.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD
J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, *Publishing Director*

A McGraw-Hill Publication
Tenth Avenue at 36th Street, New York

Performance Records Required

At the fall meeting of the Associated General Contractors of America, last month, a resolution was adopted requiring applicants for membership to file their performance records with the Bureau of Contract Information as a qualification for admission to the organization. The move is in line with the recent declaration of Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, that "the only competition that can be helpful to the public is the competition of efficiency."

Against Convict Labor

Foreseeing a convict labor monopoly of public works construction unless the growing menace of prison labor utilization in the construction industry is checked, the Executive Board of the Associated General Contractors of America will formulate a construction program looking toward the satisfactory employment of prisoners in other than competitive fields.

Testing Welds With Electro-Magnets

AN IMPORTANT advance in methods of testing welds in production without destroying them was explained by T. P. Watts of the Research Laboratories of the Westinghouse Electric & Manufacturing Co. in a paper presented recently before the American Welding Society. Hitherto, the impossibility of testing welds without knocking them apart has been the greatest drawback to this method of uniting pieces of metal. "For butt welds, in which the edges of steel bars or plates are welded together without lapping," said Mr. Watts, "we have developed magnetic methods of testing which can be successfully applied, using only simple, easily portable apparatus, requiring very little skill and training on the part of the tester. The tests are made by 'bridging' the welded seam with a large horse-shoe electro-magnet and 'exploring' the magnetic field in the vicinity of the weld with a meter."

The method is said to be practically indifferent to surface roughness or depth of fault below the surface.

Higher Strength Tests for Cement

Revisions in the strength requirements for portland cement, recently adopted by the American Society for Testing Materials, include a change in the average tensile strength at seven days for the three standard mortar briquets from a minimum of 225 lb. per square inch to 275 lb. per square inch, and a change in the average tensile strength requirement at 28 days from a minimum of 325 lb. per square inch to 350 lb. per square inch. These revisions will bring the minimum values more in line with the general strength level maintained by portland cement plants throughout the country.

No Place for Topsies

IN HIS annual address to the American Institute of Steel Construction, President Charles N. Fitts recently offered some pat comment on how his industry should build for better business.

He spoke of the technical progress of steel construction and of the broader markets opened up by that progress. But he went on to show his associates that technical progress without promotional effort is throttled.

> "Our advertising and promotional programs should be drafted upon a three-year basis," he declared. "We cannot forever depend upon direct contacts to spread our gospel * * * Such market developments as these demand fuller explanation and more thorough advertising * * * We should not permit these markets to grow of their own volition. Modern business has no place for industrial Topsies."

Well said, Mr. Fitts! And what goes for steel goes for industry in general. Industrial advertising has become the mightiest single force making for the practical progress of the industrial arts. Only through the incessant advertising of better methods, better materials and better equipment is industry driven forward to higher accomplishment. Better methods, like better markets, do not "grow of their own volition." And the only man who has nothing to advertise is the man who has nothing better to offer.

And let us note in passing the necessary converse of this proposition. It is equally true that the modern industrial executive—the engineer, the constructor and the others—"cannot forever depend upon direct contact" to keep abreast of his job. His progress, to paraphase Mr. Fitts, demands, "fuller *understanding* and more thorough *reading* of advertising. He cannot permit his *competence* to grow of its own volition. Modern business has no place for industrial Topsies *in executive and productive positions.*" The only man who need not read advertising is the man who has nothing to learn.

In short, industrial advertising, soundly written and thoughtfully read, has become an essential of industrial progress. The advertising pages of *Construction Methods* are helping to meet this need in the construction industry.

Willard Chevalier
Publishing Director

McGRAW-HILL PUBLISHING COMPANY, INC., TENTH AVENUE AT 36TH STREET, NEW YORK, N. Y.

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THOMAS HOISTS

SPEED UP CONSTRUCTION of

WORLD'S TALLEST BUILDING

Empire State Building, New York City, 85 Stories, 1046 Feet High

"We want you to know that we are well pleased with the 200 H. P. Thomas High Speed Single Drum Hoists we are using on the Empire State Building job. On a construction job of such height, we were confronted with the problem of handling a large volume of material at the greatest possible speed. The Thomas Hoists have solved this problem to our entire satisfaction."

STARRETT BROTHERS & EKEN, Inc.
J. BOWSER, Superintendent

Thomas 200 H. P. High Speed, Single Drum, Band Friction, Roller Bearing Hoist.

THOMAS ELEVATOR COMPANY

20 SO. HOYNE AVENUE ~ CHICAGO

Construction Men Like Autocars . . .

Autocar trucks are widely popular with construction men. Each Autocar in the building trade proves the precision-craftsmanship of its builders at Ardmore by performing faithfully for years. » » » Precision-building methods endow Autocar trucks with the ruggedness and stamina that contribute to Autocar popularity. The men who design and build Autocars are very, very busy because they are never too hurried to produce the best that can be made in motor transportation for the construction man.

There are Autocar models for every need. There are Autocar factory service branches in all parts of the country. Dependable performance and readily available service make Autocar trucks the champions of long run economy.

WHAT ARE YOUR TRUCKING NEEDS?

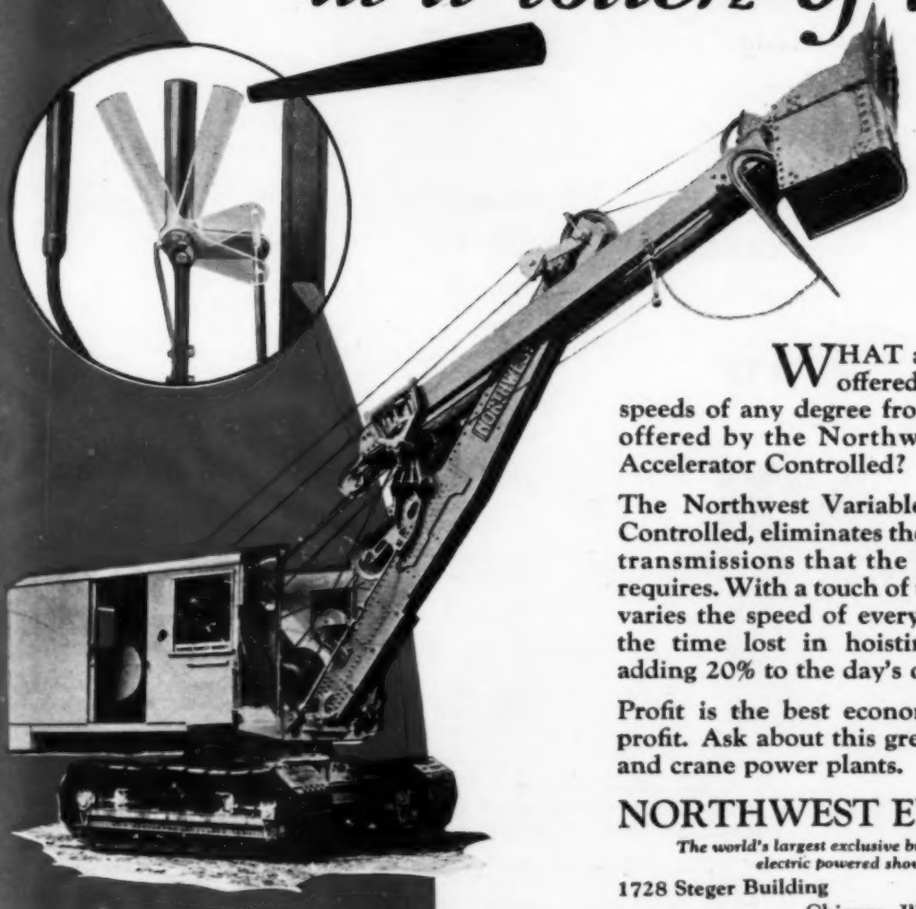
This 6-cylinder, SCHS Autocar chassis, 170-inch wheelbase, mounted with Blaw-Knox agitator body and Heil hydraulic hoist is one of a fleet of trucks owned by the Warner Company, Philadelphia, and used to supply concrete ready-to-pour.

PRECISION BUILT

AUTOCAR TRUCKS

THE AUTOCAR COMPANY, ARDMORE, PA.

NOT ONE SPEED—
NOT TWO SPEEDS—
BUT *any speed*
at a touch of a lever



WHAT are the two speeds usually offered compared to the range of speeds of any degree from the lowest to the highest offered by the Northwest Variable Speed Motor, Accelerator Controlled?

The Northwest Variable Speed Motor, Accelcrator Controlled, eliminates the complicated gear trains and transmissions that the usual two-speed operation requires. With a touch of the accelerator your operator varies the speed of every operation at will, reducing the time lost in hoisting, swinging and traveling, adding 20% to the day's output.

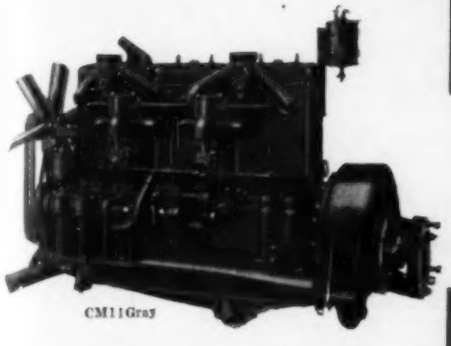
Profit is the best economy and dirt moved means profit. Ask about this greatest development in shovel and crane power plants.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

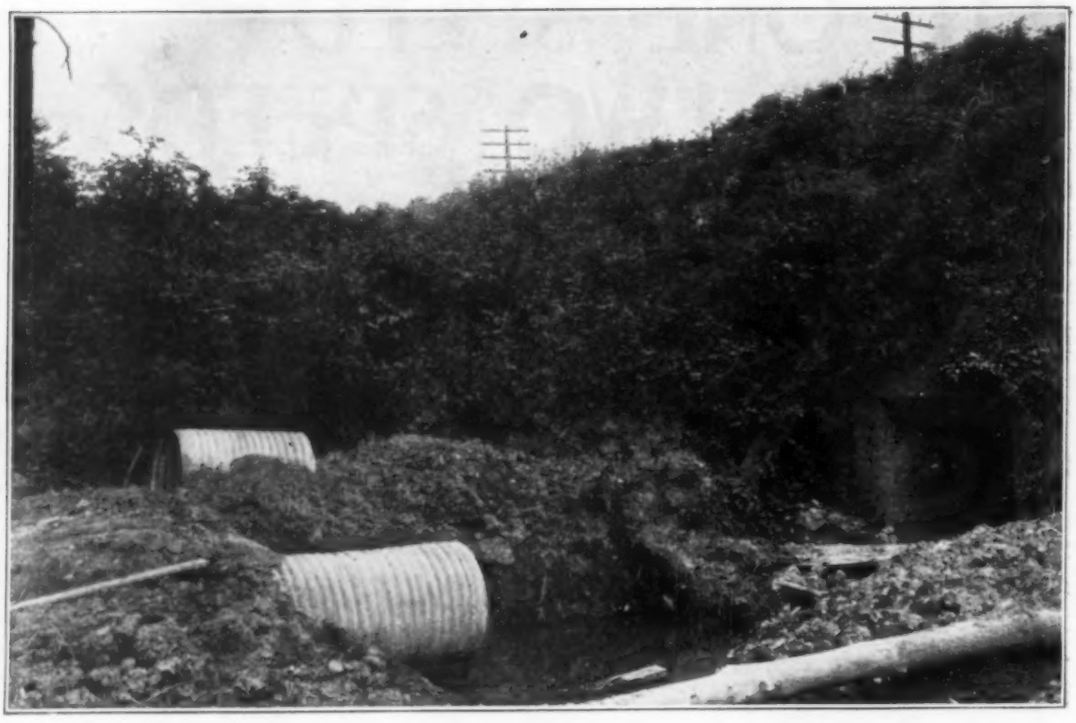
1728 Steger Building — 28 East Jackson Boulevard

Chicago, Illinois, U. S. A.



CM11Gray

NORTHWEST



For reclamation of waste ground . . .

GENUINE OPEN HEARTH IRON
GOHI
TRADE MARK
PURE IRON - COPPER ALLOY
REG. U.S. PAT. OFF.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Corrugated Culverts Prove Best

SIX years ago a large industrial plant added several acres to its operating area by installing GOHI Culverts along the bed of a creek and making a 35-foot fill.

The fill was of such material that replacement of the culvert would be practically impossible. Today a railroad siding runs along the line of the culvert and the reclaimed area is occupied by factory buildings.

Because of the unusual conditions, the choice of GOHI Culverts was logical and made certain a permanent installation.

Made of GOHI, Genuine Open Hearth Iron, pure iron-copper alloy, GOHI Culverts offer unusual resistance to corrosion and give years and years of trouble-free service. Easily handled. Quickly installed.

No days of delay between start and finish of installation. No repairs. No upkeep. No breakage. Thousands of installations establish their lasting life.

The same qualities of excellence, which made GOHI Culverts the choice for this reclamation job, are the reasons why you should use GOHI for all highway drainage, and other culvert installations.

Get the facts . . . all the facts . . . and you'll be satisfied with nothing but GOHI.

Use GOHI Culverts for

- Highway Drainage
- Airports
- Storm Sewers
- Railway Roadbed Drainage
- Real Estate Developments
- Golf Courses
- Drainage of reclamation areas
- Temporary or permanent Flumes.
- Reservoir Syphons and Outlets

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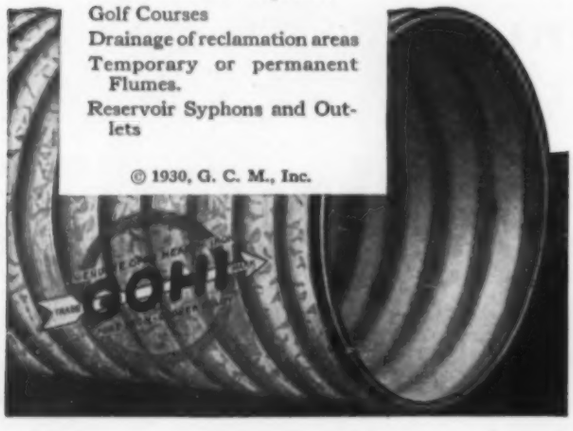


GOHI CULVERT MANUFACTURERS, Inc.
Newport, Ky.

Lincoln Steel and Forge Co. St. Louis, Mo.	**Tennison Brothers** Texarkana, Ark.
The Newport Culvert Co. Newport, Ky.	**Capital City Culvert Co.** Madison, Wis.
The Pennsylvania Culvert Co. Philadelphia, Pa.	**Central Culvert Co.** Ottumwa, Iowa
Denver Steel & Iron Works Co. Denver, Colo.	**Roanoke Sales Corp.** Roanoke, Va.
A. N. Eaton, Metal Products Omaha, Nebr.	**St. Paul Corrugating Co.** St. Paul, Minn.
Feenaughty Machinery Co. Portland, Oregon	**Tennison Brothers** Oklahoma City, Okla.

Weighing BATCHERPLANTS

This 150-ton Three Compartment BATCHERPLANT is equipped with a fast operating Blaw-Knox *Triple* WEIGHING BATCHER.

Owned and operated by D. Lewis, Belford, N. J.

Blaw-Knox Weighing BATCHERPLANTS are *dependable.*

They are *properly serviced*—they are *profitable* to use, *as fully described in Catalog No. 1105.*

BLAW-KNOX COMPANY

2086 Farmers Bank Bldg., Pittsburgh, Pa.

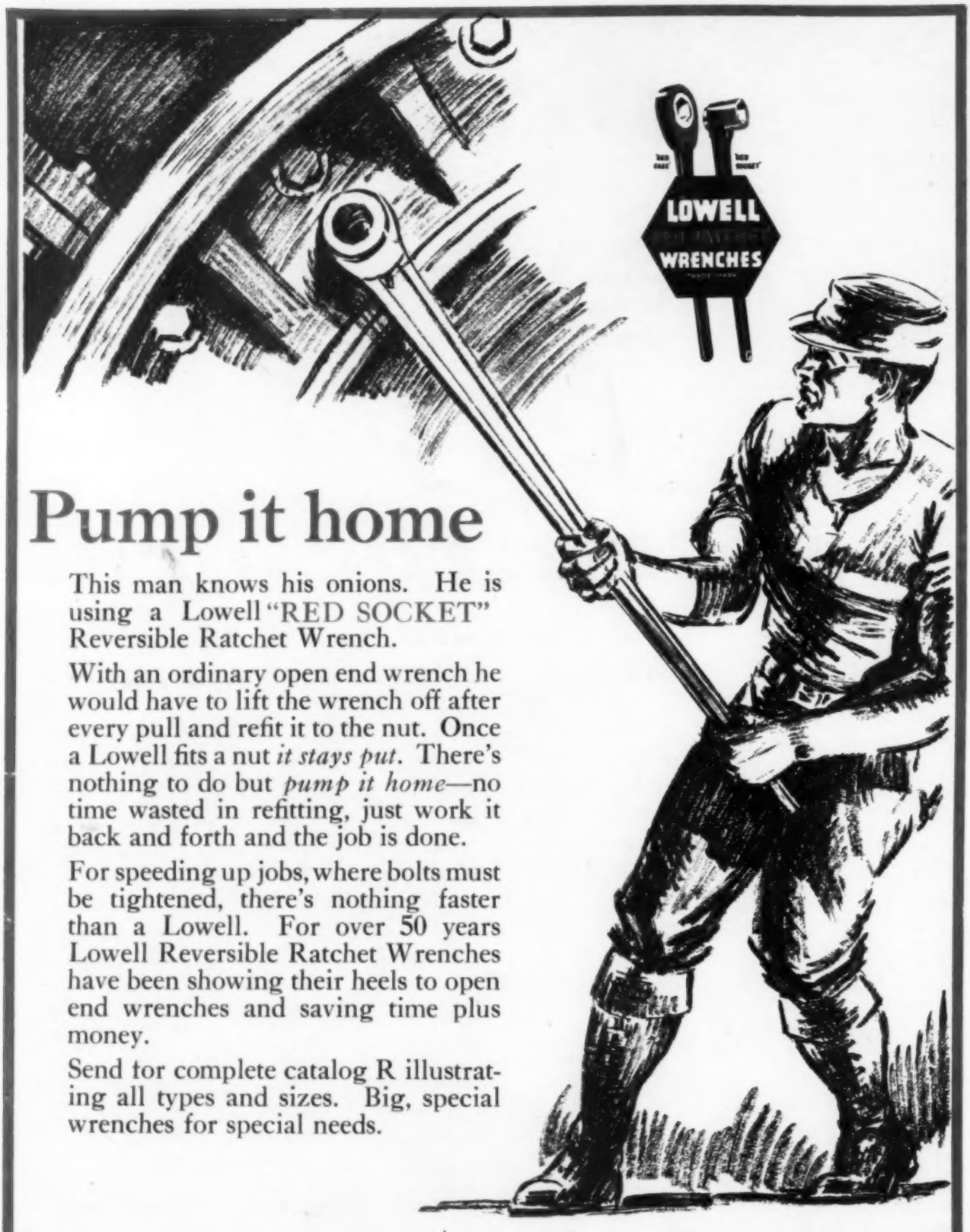
New York, Philadelphia, Chicago, Birmingham, Boston, Detroit, Cleveland, Buffalo, Baltimore

Export Division:

Blaw-Knox International Corporation, Canadian Pacific Bldg., New York

London, England, New Oxford House, Hart St., Holborn, W. C. 1.—Paris, France, 1 Rue de Clichy—Milan, Italy, 6, via S. Agnese, 6—Dusseldorf, Germany, 17 Bismarckstrasse

BLAW-KNOX



Pump it home

This man knows his onions. He is using a Lowell "RED SOCKET" Reversible Ratchet Wrench.

With an ordinary open end wrench he would have to lift the wrench off after every pull and refit it to the nut. Once a Lowell fits a nut *it stays put*. There's nothing to do but *pump it home*—no time wasted in refitting, just work it back and forth and the job is done.

For speeding up jobs, where bolts must be tightened, there's nothing faster than a Lowell. For over 50 years Lowell Reversible Ratchet Wrenches have been showing their heels to open end wrenches and saving time plus money.

Send for complete catalog R illustrating all types and sizes. Big, special wrenches for special needs.

LOWELL WRENCH COMPANY

Worcester Mass.

1880—Onesmall factory; the first Bucyrus shovel.

50th anniversary!

of the oldest and largest makers of excavating equipment

In November, 1880—exactly 50 years ago—this organization had its beginning. In this half-century, *not a single week* has passed but some order has been shipped.

Today, Bucyrus-Erie stands supreme not only in mere size but in its advantages in serving you. Bucyrus-Erie and no other can give you . . . 50 years of field, shop and engineering experience . . . Three great specialized plants . . . A complete line containing exactly the machine to fit your work . . . Service stations throughout the United States . . . The experience gained by building over 11,000 machines.

Investigate what these advantages mean in terms of lower unit costs for your excavating.

1930 — the world's most complete line — all sizes, types and powers. *Plants*: So. Milwaukee, Wis.; Erie, Pa.; Evansville, Ind. *General Offices*: South Milwaukee, Wis.

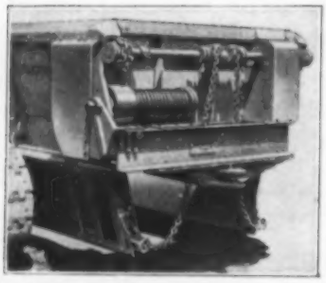
A-211—11-30—CM

BUCYRUS ERIE

Representatives throughout the U. S. A. Offices or distributors in all principal countries. *Branch Offices*: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

The dump boss winding the doors of Western Crawler wagons equipped with spring wind-up. Notice that he trips the lever and the doors close all in one stride.

No Haul Too Short for the Fast Western Spring Wind-Up



The simple mechanism of the Western Spring Wind-up is mounted entirely on the wagon. No special connections are required on the tractor.

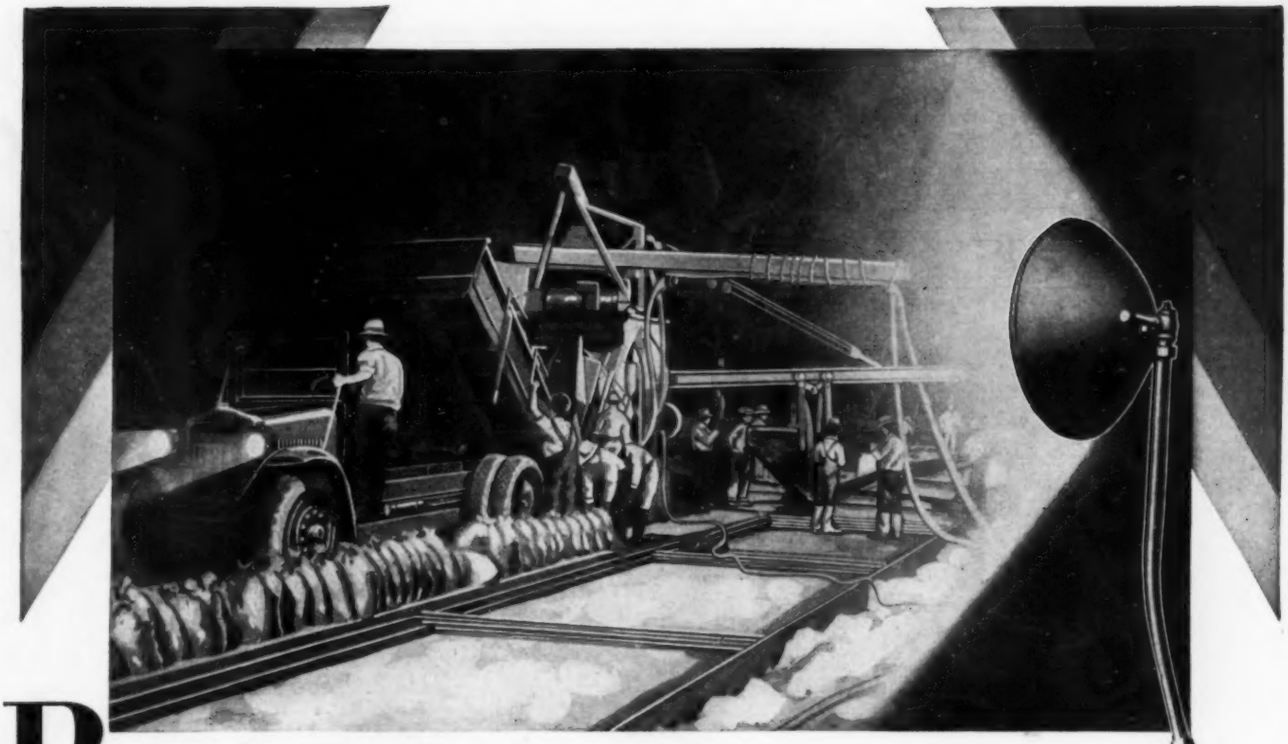
THE Western Spring Wind-Up makes the great capacity of Western Crawler wagons available for short haul work. No haul is too short for closing the doors. Your tractor driver pulls the cord or your dump boss moves a lever and, *Bang!* go the doors into place. The same lever or cord dumps the big load.

Equip your Western Crawler wagons, new or old, with this Spring Wind-Up. It is simple; saves time; saves labor; requires no attachment on your tractor.

A Chicago contractor recently made a competitive working test of ALL automatic wind-ups and then installed Western Crawler wagons with Spring Wind-Ups. May we tell you about it? Write for details today.

Western Wheeled Scraper Company
Aurora, Illinois, U. S. A.

WESTERN



PRESSED FOR TIME?

When you lose valuable time because of breakdowns, adverse weather conditions, or other emergencies—

Put Carbic Flood Lights to work!

Bring your work up to schedule—and keep it there. Any time is working time for the contractor equipped with Carbic Flood Lights.

Carbic Flood Lights afford ideal illumination for night work. Their powerful rays enable your men to work rapidly and safely at night. There is no glare, and no dark shadow. Penetrates fog, smoke or dust to a remarkable degree.

The initial cost of the Carbic Flood Lights is low, and the operating expense is negligible.

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

CARBIC

PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

OXWELD ACETYLENE COMPANY

Unit of Union Carbide UCC *and Carbon Corporation*
NEW YORK

Sales offices in principal cities

CM-11-30

Technical Publicity Dept., 12th floor
205 East 42nd Street, New York, N. Y.

Without obligation, I would like to have additional information on Carbic Lights.

Name.....

Street Address.....

City.....*State*.....

STRUCTURAL STEEL CREATED THE SKYSCRAPER

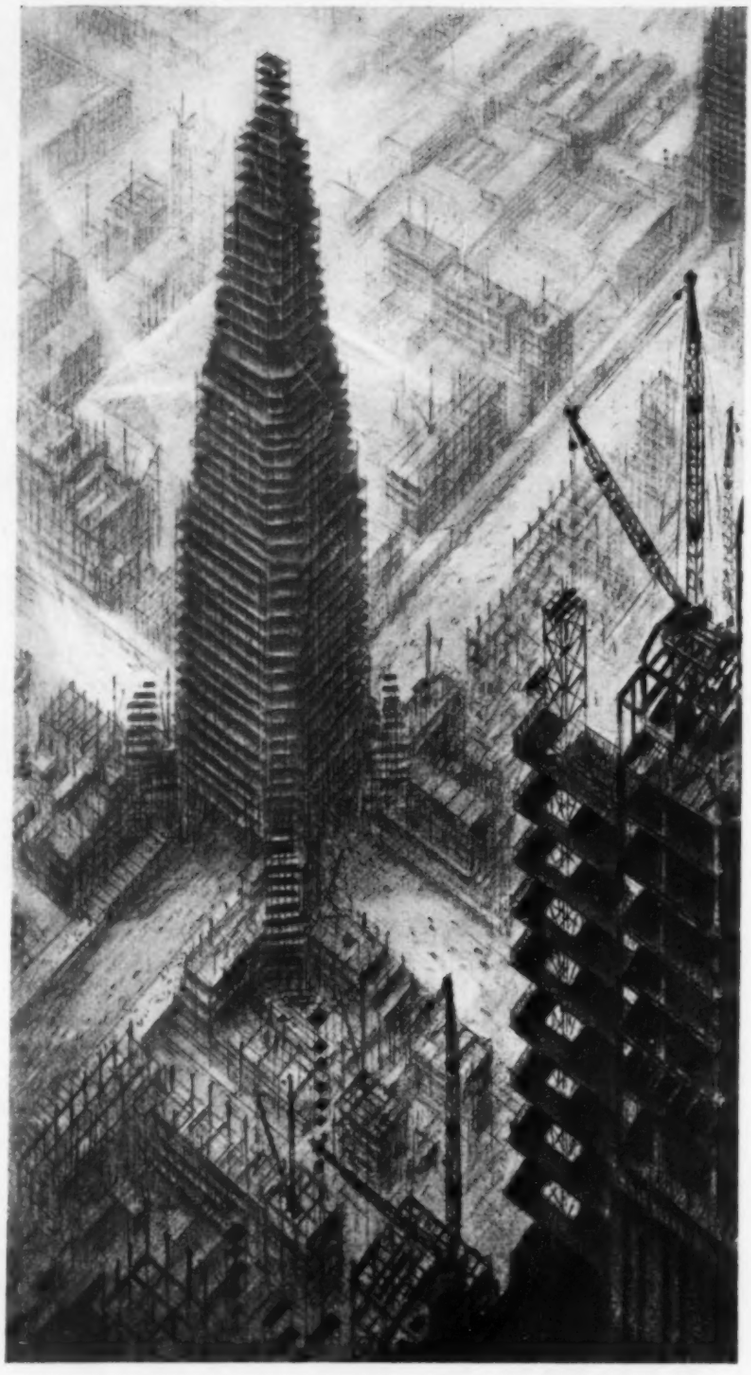
INEVITABLE . . . THE ALL-STEEL CITY

TODAY's breath-taking spires and spans of steel were "impossible" only a few brief years ago. Now walls of masonry are yielding to solid-section steel windows . . . new beauty comes in steel shapes and new skill devises their application . . . and on the horizon looms the amazing battle-deck floor.

Eventually, cities will be all steel. Not only the skyscrapers and great bridges, but the homes, schools, small apartment and mercantile houses, small factories and small bridges as well. For steel is the strongest, most versatile and fastest building material. Fabricated in mills, weather cannot delay its production—and rain, intense heat, or freezing does not impair its strength. It can be erected anywhere, at any time, as long as men can work—thus earlier returns on invested capital are insured, interest charges are saved.

In cities, too, there is constant change, growth. Small structures give way to larger ones—must be altered, added to or replaced. Steel facilitates alteration and addition—and no other building material has such high salvage value, is so economically recovered, or is so readily marketed afterward.

Before building anything find out what steel can do for you. The Institute serves as a clearing house for technical and economic information on structural steel, and offers full and free co-operation in the use of such data to architects, engineers and all others interested.

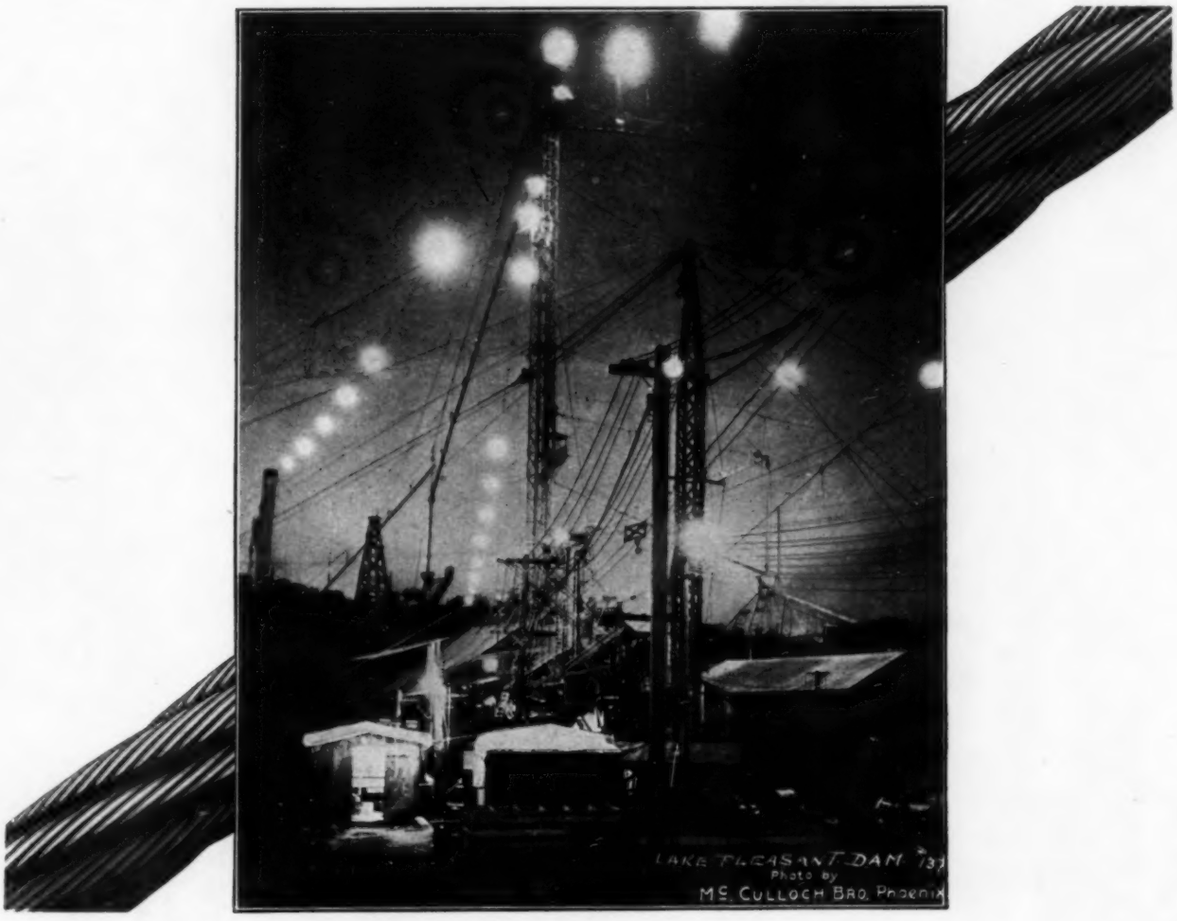


"BUILDING THE CITY OF STEEL"—BY HUGH FERRISS. AN ENLARGEMENT, ON SPECIAL STOCK FOR FRAMING, WILL BE MAILED WITHOUT CHARGE TO ANY ARCHITECT, ENGINEER OR BUSINESS EXECUTIVE.

The co-operative non-profit service organization of the structural steel industry of North America. Through its extensive test and research program, the Institute aims to establish the full facts regarding steel in relation to every type of construction. The Institute's many publications, covering every phase of steel construction, are available on request. Please address all inquiries to 200 Madison Avenue, New York City. Canadian address: 710 Bank of Hamilton Bldg., Toronto, Ontario. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas San Francisco and Toronto.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY



"Hercules" (Red-Strand) Wire Rope

Its sturdiness helps speed up rush work

When speed is essential, dependable wire rope is necessary, for when a rope fails, the equipment on which it is used is temporarily out of business.

"HERCULES" (Red-Strand) Wire Rope is dependable because it is made of acid steel wire, and every wire that goes into it is first rigidly tested by us to make sure that it meets our exacting requirements. Any wire lacking in any particular is rejected.

If you want wire rope that will keep your work on a safe, fast and economical basis, give "HERCULES" a chance to show you what it can do. Try it on your hardest work, and keep a record of its service.

Made Only by **A. LESCHEN & SONS ROPE CO.** Established 1857

5909 Kennerly Avenue

ST. LOUIS

New York · **Chicago** · **Denver** · **San Francisco**

THE matter of "what power" is distinctly up to you when you buy a WILEY WHIRLEY—We champion no particular kind. Frequently the kind of power is dictated by conditions which leave no choice. We equip WILEY WHIRLEYS with gas, electric or steam power so that, if you have a choice, you may select the kind best suited to your requirements.

In powering any machine the relation of the power to the duty and to the strength of the machine should be kept in mind. The power must be sufficient to perform the duty to be imposed. It must not be so great as to seriously reduce the factor of safety of the machine as a whole or its individual parts. We proportion power to WILEY WHIRLEYS with these essential requirements in view.

Furthermore, we arrange the power units with a view to their convenient control. All control levers are assembled in a quadrant bank at the forward right hand corner of the rotating frame, where the operator has unobstructed vision over his work and his engines.

Careful attention is given to the number of hand and foot levers and their relative location in the bank. We bow to the limitations set by nature in endowing operators with only two hands and two feet and arrange our power controls so that these will be sufficient.

We shall be glad to consult with you on your power problems as well as other matters connected with WILEY WHIRLEYS.

Have you our catalog?

THE DAYTON WHIRLEY CO.

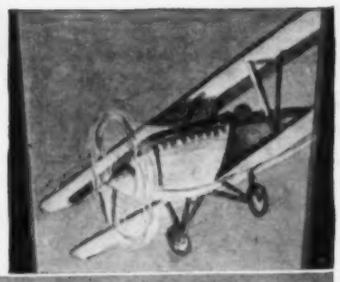
DAYTON, OHIO

WILEY WHIRLEY

. . . a traveling, revolving, long reach, heavy duty, steel Derrick . . .

Built since 1919

NOW *ROOSEVELT FIELD* BOASTS COLAS RUNWAYS



RUNWAYS and taxiways on many of the finest airports in the world are now built with Colas. Low cost, safety and durability are the factors that make Colas unequalled for airport surfacing.

It is these qualities that give Colas surfaces an excellence that is recognized all the over the world.

A word to our nearest office will place our engineering staff at your service.

FLINTKOTE ROADS INC.

(COLAS LICENSEES)

NEW YORK BOSTON CHICAGO

NEW ORLEANS CINCINNATI ATLANTA DALLAS

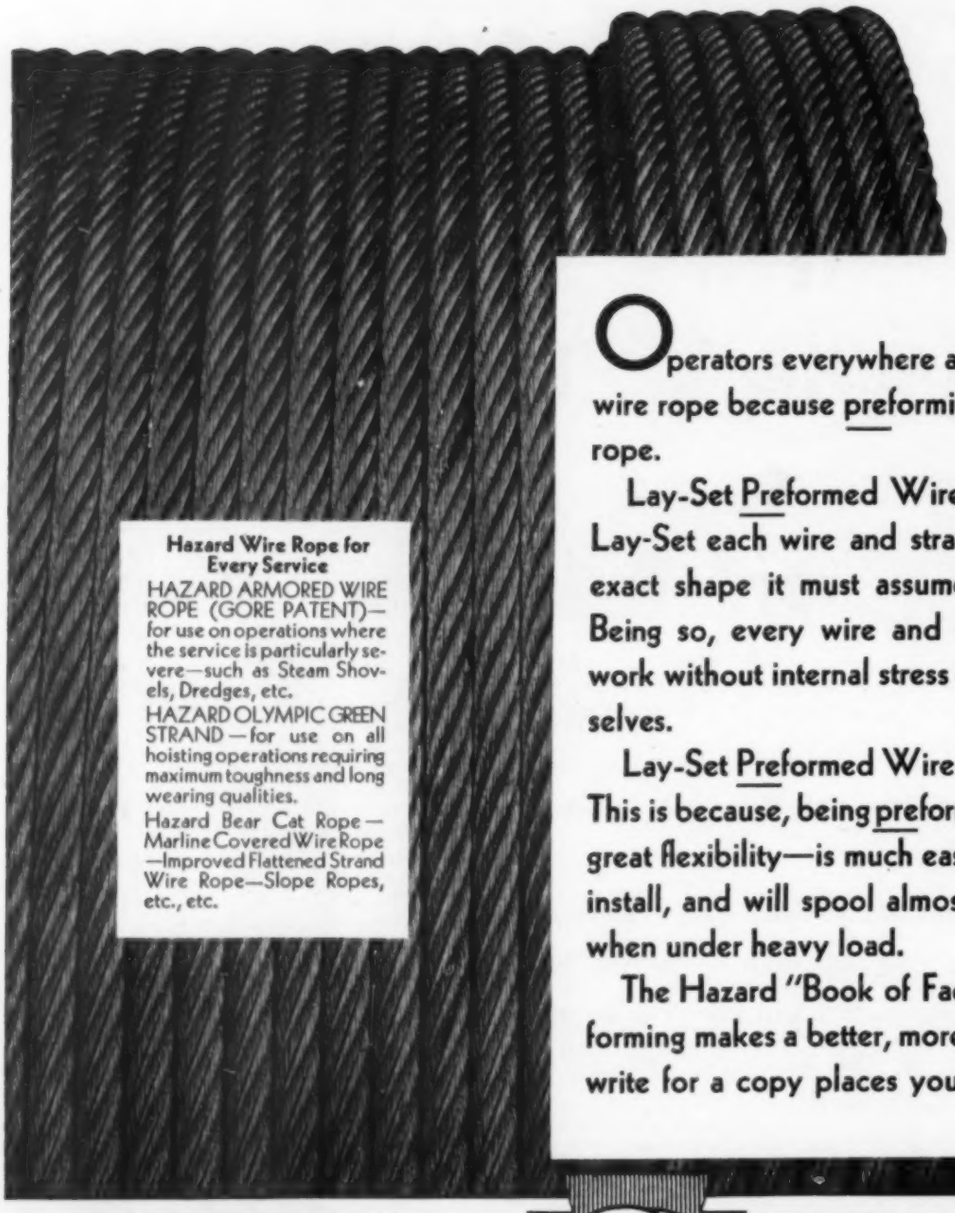
ASSOCIATED COMPANIES THROUGHOUT THE WORLD

COLAS REG. TRADE MARK

BUILDS DURABLE LOW-COST ROADS

HAZARD PREFORMED LAY-SET WIRE ROPE

WEARS LONGER
SPOOLS PERFECTLY



Hazard Wire Rope for Every Service

HAZARD ARMORED WIRE ROPE (GORE PATENT)—for use on operations where the service is particularly severe—such as Steam Shovels, Dredges, etc.

HAZARD OLYMPIC GREEN STRAND—for use on all hoisting operations requiring maximum toughness and long wearing qualities.

Hazard Bear Cat Rope—Marline Covered Wire Rope—Improved Flattened Strand Wire Rope—Slope Ropes, etc., etc.

Operators everywhere are turning to preformed wire rope because preforming makes a much better rope.

Lay-Set Preformed Wire Rope *wears longer*. In Lay-Set each wire and strand is preformed to the exact shape it must assume in the finished rope. Being so, every wire and strand is free to do its work without internal stress or friction among themselves.

Lay-Set Preformed Wire Rope *spools perfectly*. This is because, being preformed, Lay-Set possesses great flexibility—is much easier to handle, faster to install, and will spool almost as tight when idle as when under heavy load.

The Hazard "Book of Facts" explains *why* preforming makes a better, more economical, rope. To write for a copy places you under no obligation.

HAZARD WIRE ROPE COMPANY
WILKES-BARRE PENNSYLVANIA

New York Pittsburgh Chicago
Birmingham Philadelphia
Denver Los Angeles San Francisco
Fort Worth Tacoma

A

LORAIN machine with Center Drive Shovel boom, will reach out farther, dig and dump higher up than any other shovel of equal length boom and dipper stick. And it will dig deeper below the treads.

THE THEW SHOVEL COMPANY • LORAIN, OHIO

THEW LORAIN

45 . . 55 . . 75 . .

Save Time on the Nut-Turning Portion of the Contract

The Class of Contractors using the "FAVORITE" Wrench proves its exceptional time-saving possibilities in nut turning.

THE FAVORITE reversible ratchet WRENCH

turns nuts with the quick ratchet movement that avoids the time-wasting motions of the old-style open-end wrench that has to be removed from the nut several times before operation is completed.

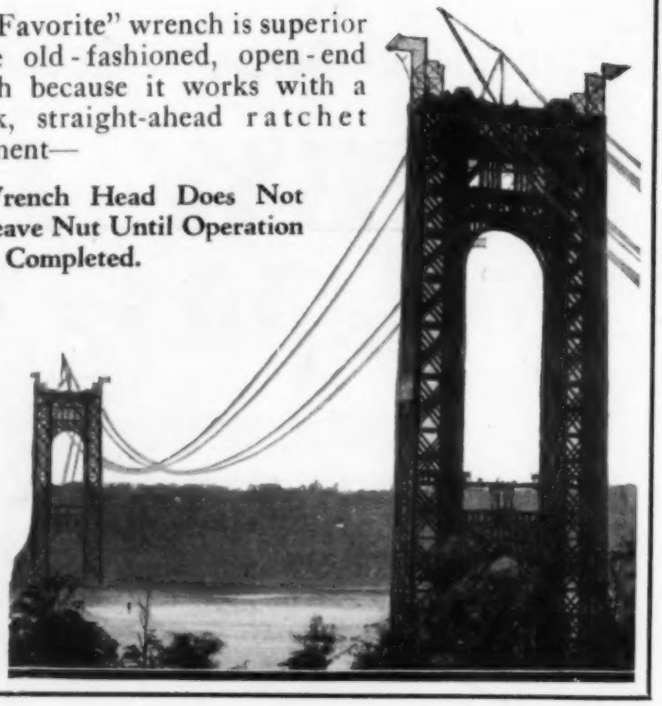
Slipping from nut is avoided by the socket form of head, which encompasses nut on all sides with an equal pressure.

"Favorite" Wrench used on piers of new Hudson River Bridge at 178th St., New York City, being built by Port of New York Authority; cables constructed by John A. Roebling Sons Co.

Built Strong For Rough Usage

The "Favorite" wrench is superior to the old-fashioned, open-end wrench because it works with a quick, straight-ahead ratchet movement—

Wrench Head Does Not Leave Nut Until Operation Is Completed.



The Up-to-Date Method of Turning Nuts—
Use a "FAVORITE" WRENCH

Let us tell you about the time-saving qualities of the "Favorite" Wrench.

Write for full particulars.

GREENE, TWEED & CO.
Sole Manufacturers
109 Duane St., New York

CATERPILLAR
REG. U.S. PAT. OFF.

BETTER . . QUICKER . . CHEAPER

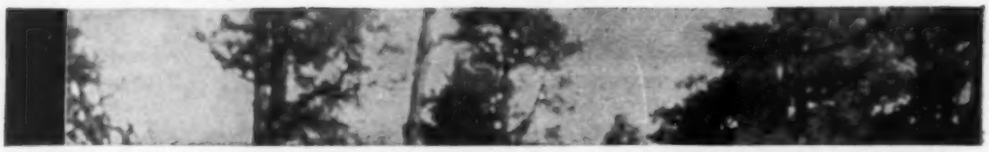
HERE'S modern equipment moving earth at the lowest cost per cubic yard — "Caterpillar" Tractors, "Caterpillar" Elevating Grader and modern wagons. Here's plenty of power to fight hard earth — here's plenty of traction to ignore light rains — here's dependability to banish the fear of a shut-down.

Prices— f. o. b. Peoria, Illinois

TEN	$1100
FIFTEEN	$1450
TWENTY	$1900
THIRTY	$2375
SIXTY	$4175

Caterpillar Tractor Co.

PEORIA, ILL. *and* SAN LEANDRO, CALIF., U. S. A.
Track-type Tractors Combines Road Machinery
(There's a "Caterpillar" Dealer Near You)



UP AND OVER . . . JUST LIKE A MOUNTAIN GOAT!

WHEREVER your job may be . . . no matter whether the going be rough and rugged or soft and miry . . . you can always count on Davey Compressors delivering air, and plenty of it, right on the spot where it is required . . . for "Daveys" are the ideal compressors for tractor mounting.

They will go wherever wheels can roll or "cats" can crawl. Special mountings are designed for "Caterpillar" and McCormick-Deering Tractors, with soundly-engineered method of power take-off. There is not the slightest interference with drawbar and other work.

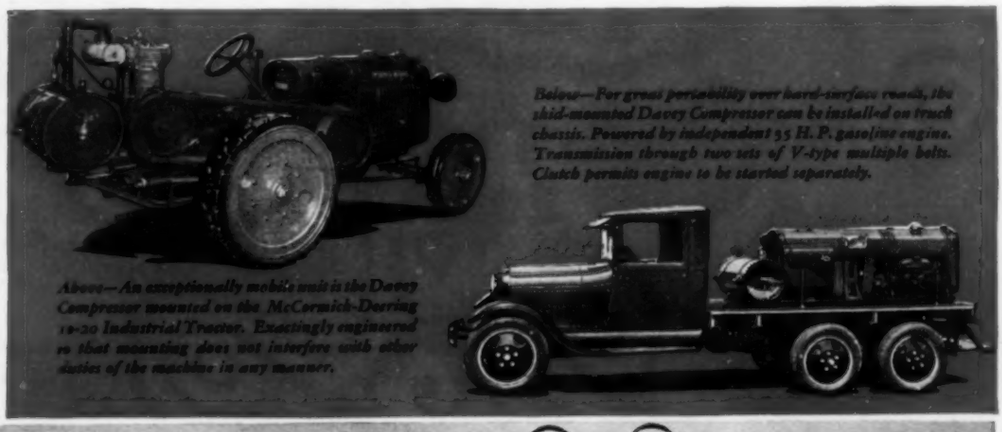
To blaze the way for a cut, or to travel over a new fill . . . to go straight uphill . . . to clamber among rocks or through swamps . . . to trundle over railroad tracks or other obstructions . . . But why make a long list, when you can name a better one out of your own jobs? Davey Compressors, tractor mounted, will deliver air personally to the job, and will push right ahead as the job pushes ahead . . . saving hours, days, weeks of valuable time . . . eliminating the laying of long, costly air lines.

Davey Compressors are also furnished as trailers with any style wheel, and skid-mounted for use on trucks, push-cars or other desirable bases. These units are powered by an independent gasoline motor of standard type and make, through two sets of V-type multiple belts which tend to offset reverse torque action.

Quick portability is only *one* of the outstanding features. Davey Compressors are air-cooled . . . ***the only compressors on the market that successfully supply air-cooled air.*** Carbon formation is impossible, because compressor heads and manifold are of special aluminum alloy which disperses heat instantly through contact with outside air. Davey Compressors are light . . . approximately 1000 pounds lighter than most others of corresponding rating. *They are* the *compressors of today!*

Get all the facts. Drop a card in the mail today for our new booklet

DAVEY COMPRESSOR COMPANY, Inc., Kent, Ohio
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES



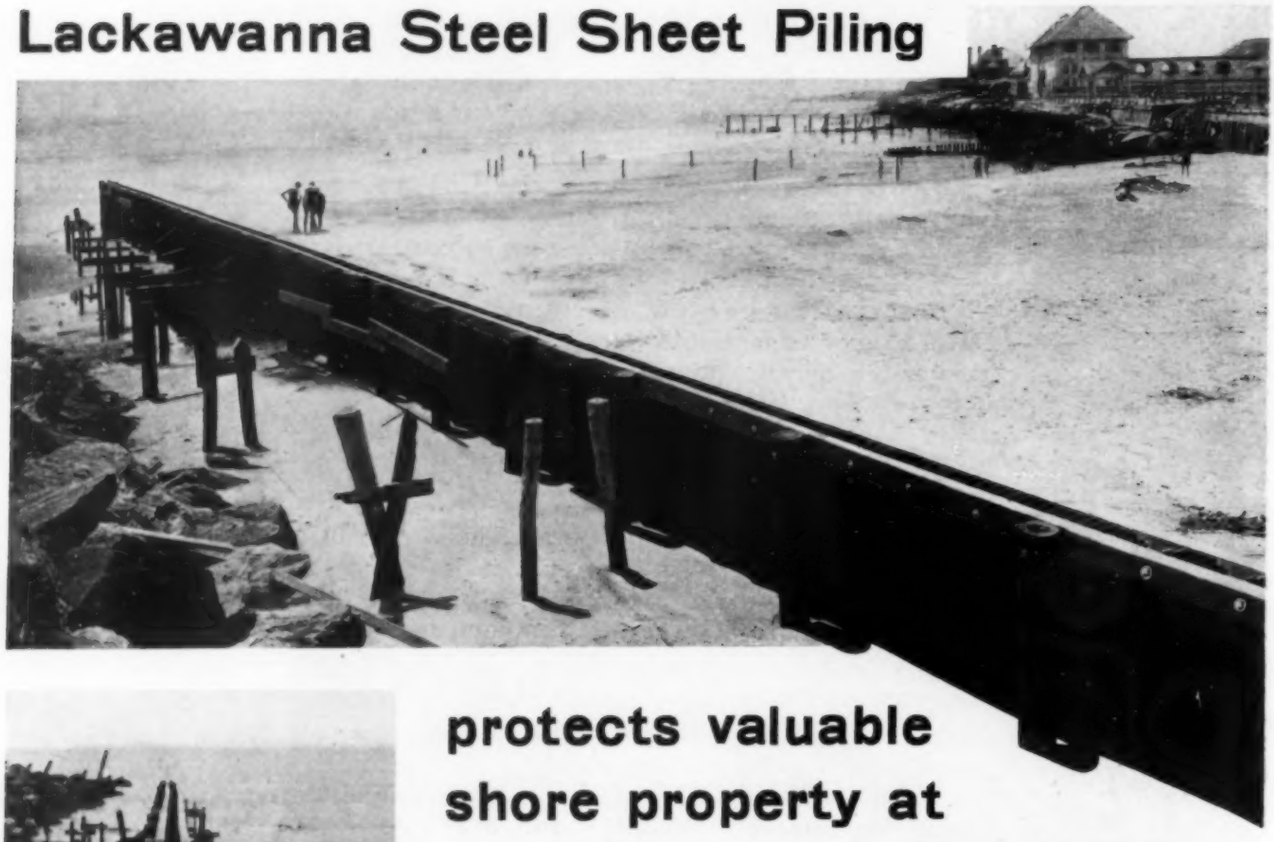
Above—An exceptionally mobile unit is the Davey Compressor mounted on the McCormick-Deering 10-20 Industrial Tractor. Exactingly engineered so that mounting does not interfere with other duties of the machine in any manner.

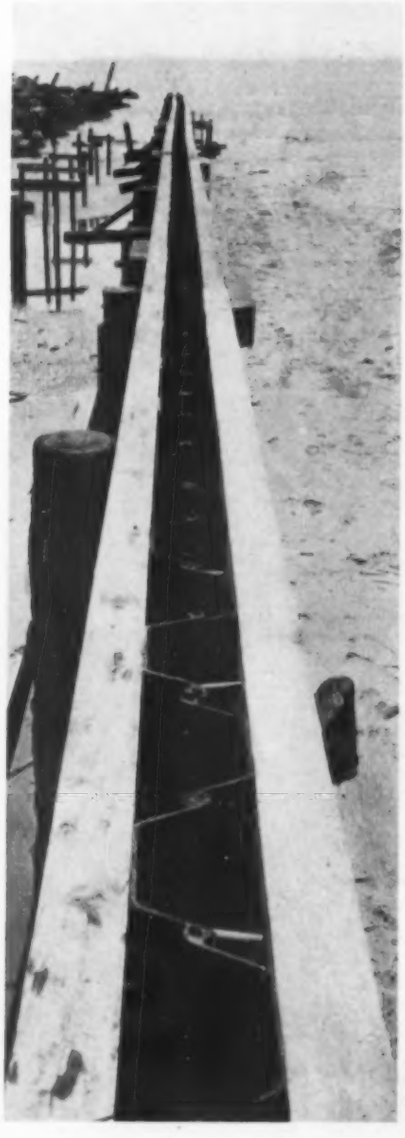
Below—For great portability over hard-surface roads, the skid-mounted Davey Compressor can be installed on truck chassis. Powered by independent 35 H. P. gasoline engine. Transmission through two sets of V-type multiple belts. Clutch permits engine to be started separately.

DAVEY Compressors

AIR COOLED AIR

Lackawanna Steel Sheet Piling





protects valuable shore property at Monmouth Beach, N. J.

The groyne of Lackawanna Deep-Arch Steel Sheet Piling, Section DP 165, shown in the illustrations, was constructed to prevent serious damage from washing away of the beach front at Monmouth Beach, N. J. This groyne interrupted the drifting sands and as a result a considerable area of new beach was built. The new beach, which can be seen to the right of the groyne, began to form even before all the piling was driven.

Lackawanna Steel Sheet Piling offers the following advantages in groyne construction:

1. Its positive, interlocking joints form a continuous wall of steel, which will not pull apart and which prevents drifting sand from passing through.

2. It possesses high lateral strength which offers great resistance to the pounding of the surf.

3. It has a useful life of twenty years, or longer.

4. It reduces the time required for construction.

5. Low cost as compared with other types of groynes.

Jesse A. Howland and Sons, Inc. Seabright, N. J., Contractors.

BETHLEHEM STEEL COMPANY

General Offices: **Bethlehem, Pa.**

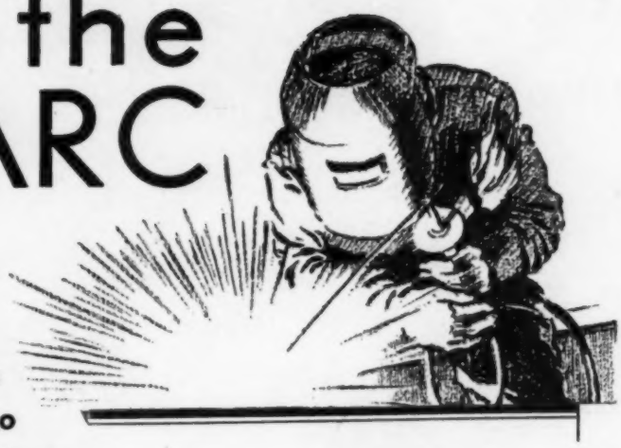
District Offices: **New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.**

Pacific Coast Distributor: **Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.**

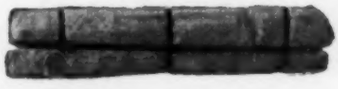
Export Distributor: **Bethlehem Steel Export Corporation, 25 Broadway, New York City**

BETHLEHEM

Build with the ELECTRIC ARC

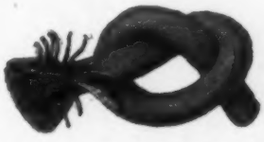


FOR that next contract—where the specifications call for arc welding—remember that General Electric can give you everything you need to build with the electric arc: ¶ . . . the famous "WD" single-operator, arc-welding sets for field erection; the G-E multiple-operator sets which furnish current to a number of operators—ideal for shop assembly; electrode wire; welding helmets; hand shields; safety glass for operators; electrode holders; welding cable; everything you need for fast, safe, successful welding. ¶If you want skilled operators, we will train your men for practical arc welding in our free welding school at Schenectady. Booklet GEA-1125 will explain. ¶If you want engineering assistance or data, our skilled, welding-application engineers and the following booklets will help you: GEA-1161, "Arc Welding Structural Steel"; GED-370, "Welding Steel Structures"; also GED-294, GED-296, and GED-298.



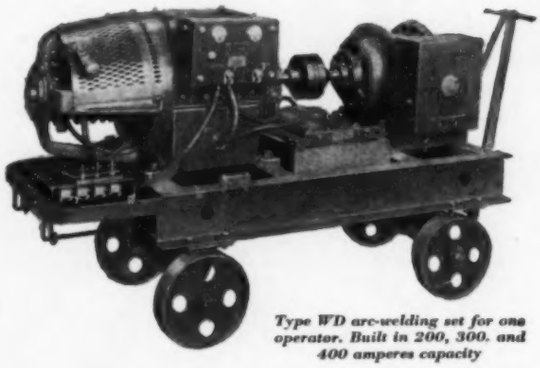
Standard 50-lb. bundle of electrode wire

Well-designed, metallic-electrode holder



Extra-flexible, well-insulated welding cable

Strong, light-weight, black-fiber helmet



Type WD arc-welding set for one operator. Built in 200, 300, and 400 amperes capacity

We cordially invite you to use these facilities by communicating with your nearest G-E office.

530-82

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

STRENGTH

SO MUCH depends on safety, especially in congested city areas, that surplus strength has been built into American Wire Rope. Our engineers are at your disposal. Let them help you select the proper construction of wire rope for your requirements.

AMERICAN
STEEL & WIRE COMPANY
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago

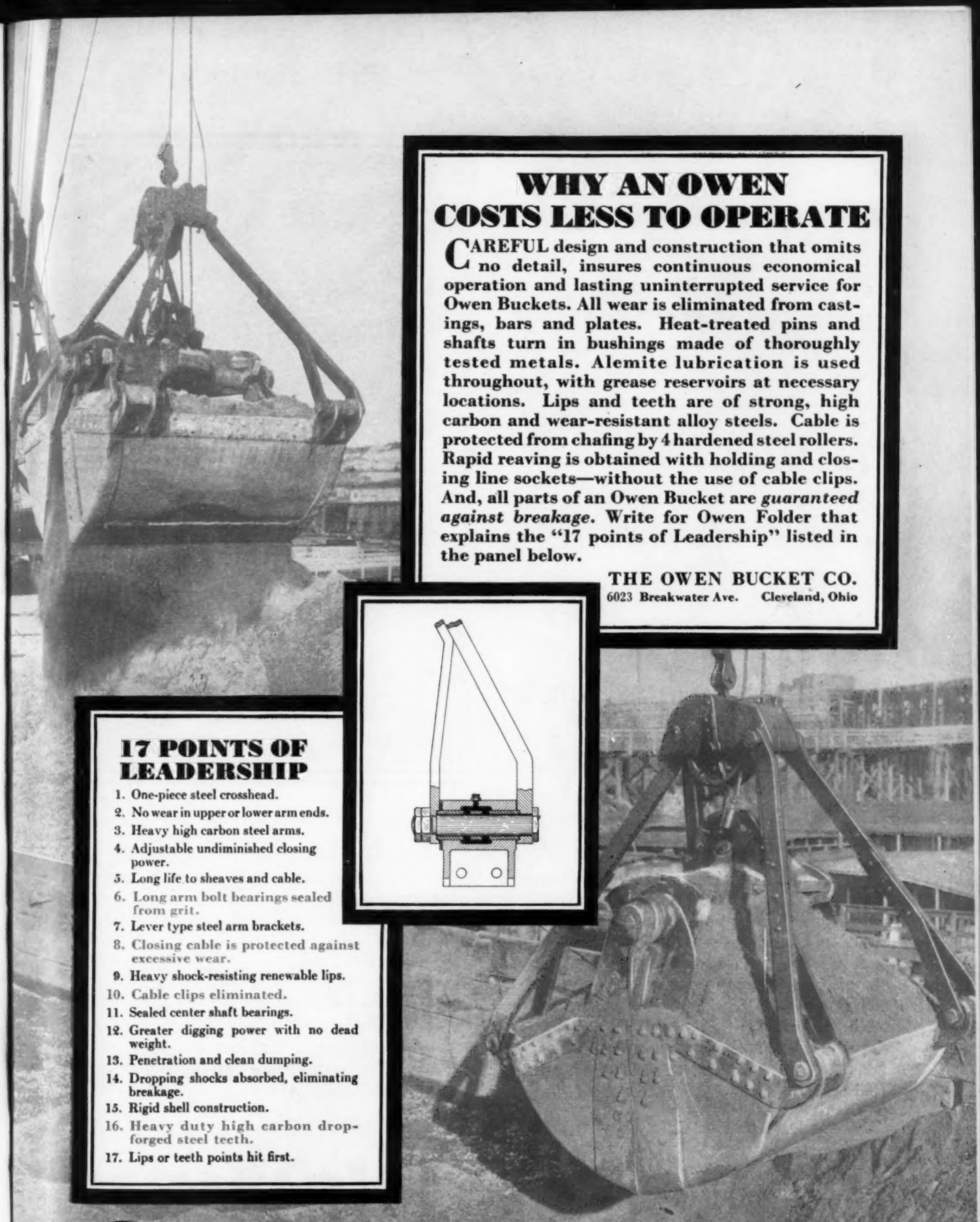
Other Sales Offices: Atlanta Baltimore Birmingham Denver Detroit Kansas City Memphis Milwaukee Pittsburgh Salt Lake City St. Louis

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

30 Church Street, New York

Boston Buffalo Cincinnati Cleveland Dallas Minneapolis-St. Paul Oklahoma City Philadelphia Wilkes-Barre Worcester

Export Distributors: United States Steel Products Co., 30 Church St., New York City



WHY AN OWEN COSTS LESS TO OPERATE

CAREFUL design and construction that omits no detail, insures continuous economical operation and lasting uninterrupted service for Owen Buckets. All wear is eliminated from castings, bars and plates. Heat-treated pins and shafts turn in bushings made of thoroughly tested metals. Alemite lubrication is used throughout, with grease reservoirs at necessary locations. Lips and teeth are of strong, high carbon and wear-resistant alloy steels. Cable is protected from chafing by 4 hardened steel rollers. Rapid reaving is obtained with holding and closing line sockets—without the use of cable clips. And, all parts of an Owen Bucket are *guaranteed against breakage*. Write for Owen Folder that explains the "17 points of Leadership" listed in the panel below.

THE OWEN BUCKET CO.
6023 Breakwater Ave. Cleveland, Ohio

17 POINTS OF LEADERSHIP

1. One-piece steel crosshead.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. Long arm bolt bearings sealed from grit.
7. Lever type steel arm brackets.
8. Closing cable is protected against excessive wear.
9. Heavy shock-resisting renewable lips.
10. Cable clips eliminated.
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. Heavy duty high carbon drop-forged steel teeth.
17. Lips or teeth points hit first.

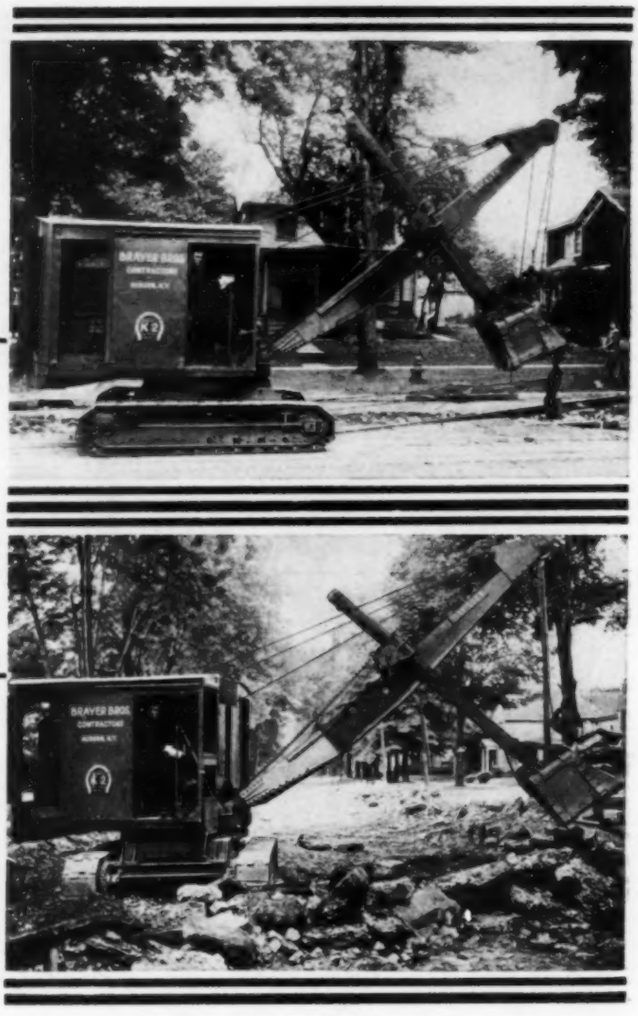
Owen Buckets

first...

the rails

then...

the pavement



—and another tough job handled by—

BAY-CITY

SUCCESSFULLY, too—Brayer Bros. have been putting their new Model K-2 through the ropes on an Auburn, N. Y., street job. The job consisted of removing old paving—a combination of brick, concrete and macadam—and street car tracks. The rails were ripped out of their foundation quickly by suspending a chain and roller yoke device from the bucket teeth. A block of rails at a time—then the shovel resumed excavation of pavement surface. (Rails removed at rate of 3 miles in 10 hours.)

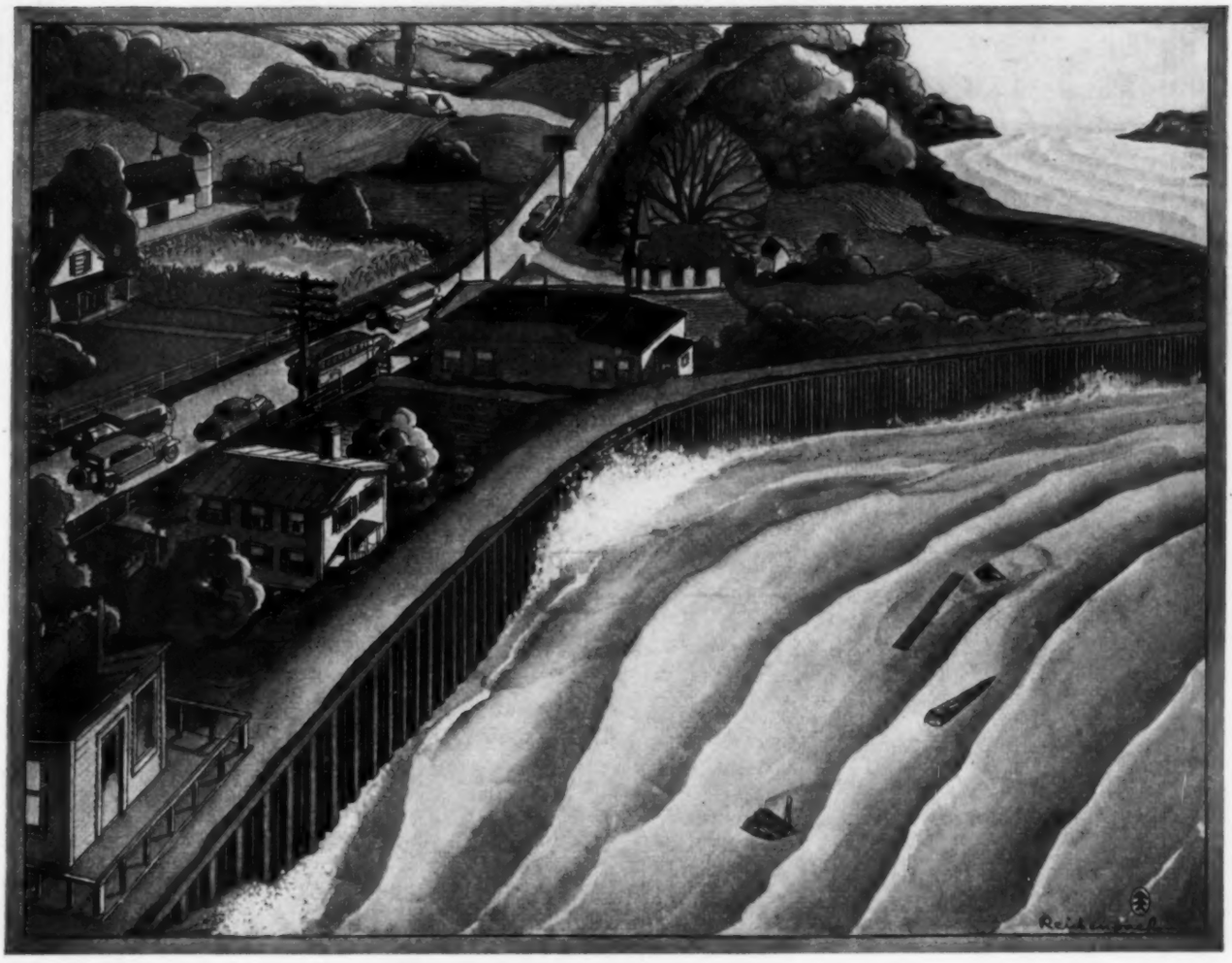
A tough job—but typical of BAY-CITY performance. Contractors all over the country are learning that where dependable, continuous service is demanded, where a convertible, easily controlled and economical machine is needed—that BAY-CITY's deliver the goods. They can do the same for you. Write now for catalogs and the name of our nearest distributor.

BAY CITY SHOVELS, INC.
BAY CITY, MICH.
NEW YORK OFFICE, 302 BROADWAY

BAY-CITY SHOVELS

THE BAY-CITY FAMILY OF FAST WORKERS

5 SIZES AND TYPES — **⅜ YARD TO 1 YARD**



Curbing the Waters

Man has ever had to deal with the vagrancy of water. Unrestricted, it becomes at times a frightful menace to his welfare. Under control, it is an invaluable servant. Engineers, faced with the problem of erosion, have found Carnegie Steel Sheet Piling an efficient and reliable device. Indispensable for deep cofferdams, its application has been extended to a great variety of uses, such as levees, wharves, slips, jetties, sea walls, cut-off and core walls for dams, canal locks, bridge piers, dam and building foundations, and retaining walls for reclamation of land along the shores of our seas, rivers and lakes. A group of practical, well-designed sections, both straight and arch web, economically fulfills the needs for this great variety of uses. All sections are rolled to a minimum of $\frac{3}{8}$" web and flange thickness to insure long life under corrosive conditions. The interlock is of especially rugged construction, and due to the circuitous passage of water through the interlock, Carnegie Piling sections are the most watertight yet devised.

Our engineering department is at the service of contractors and engineers dealing with water control. Many years in the promotion of steel sheet piling have enabled us to collect a vast amount of valuable data as to the successful accomplishment of such work.

CARNEGIE
STEEL SHEET PILING

97

CARNEGIE STEEL COMPANY · PITTSBURGH · PA. US STEEL Subsidiary of UNITED STATES STEEL CORPORATION

Under NEW Standard Specifications

Improved high-early-strength concrete is secured with *Universal Atlas* methods and cement

• • Concrete as commonly mixed, placed and cured has a compressive strength of about 2000 lb. per sq. in. in from *21 to 28 days*. A strength of 2000 lb. or more in from *2 to 3 days* is now obtained with the same Universal Atlas standard portland cement as is furnished for regular concrete work, by using high-early-strength methods of mixing and placing. Tested methods for obtaining high-early-strength concrete will be furnished by Universal Atlas on request. . . . . .

• • In addition to saving time, this high-early-strength concrete is permanently stronger, more watertight, and more durable than concrete as commonly mixed and placed. Use it to secure quality concrete on your next rush job. . . .

46A

CHICAGO
NEW YORK
NEWARK
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Universal Atlas Cement Co.

Subsidiary of United States Steel Corporation

Concrete for Permanence

MINNEAPOLIS
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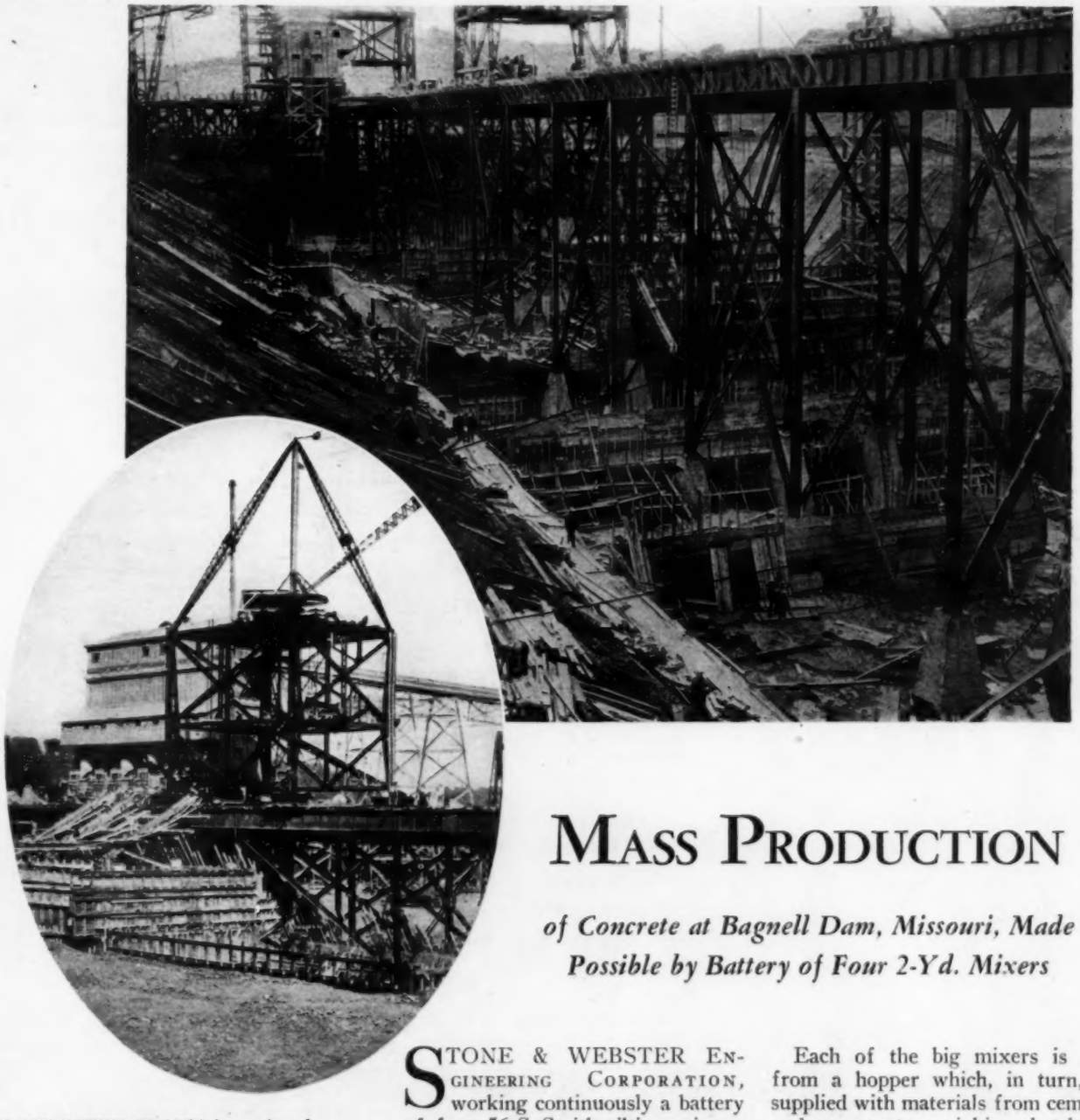
OKLAHOMA CITY
BIRMINGHAM
WACO

Construction Methods

A McGraw-Hill Publication—Established 1919

ROBERT K. TOMLIN, *Editor*

VOLUME 12 NEW YORK, NOVEMBER, 1930 NUMBER 11



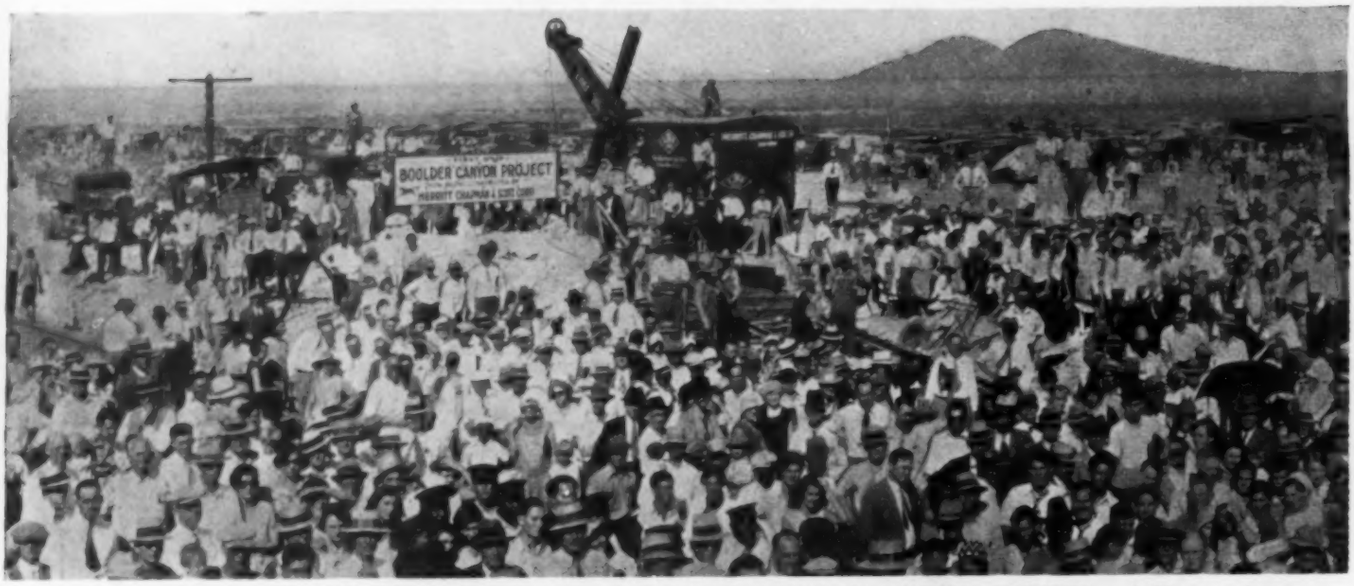
HUGE MIXER PLANT is equipped with a battery of four 2-yd. tilting units having a daily output of 5,070 cu.yd. when working continuously. Specified mixing time is 2 minutes per batch. CONSTRUCTION TRESTLE *(above, right)* of steel carries material handling and concrete placing equipment.

MASS PRODUCTION

of Concrete at Bagnell Dam, Missouri, Made Possible by Battery of Four 2-Yd. Mixers

STONE & WEBSTER ENGINEERING CORPORATION, working continuously a battery of four 56-S Smith tilting mixers, has produced 5,070 cu.yd. of concrete in 24 hours. During the week of June 8 to 14 the output was 29,812 yd., and for the month of June a total of 112,980 yd. was delivered to the forms.

Each of the big mixers is fed from a hopper which, in turn, is supplied with materials from cement and aggregate weighing batchers. Cement in bulk is used. Each batch is mixed for a period of 2 min. The mixing time is controlled by automatic batch meters which lock the mixers against tilting before the expiration of specified mixing time.



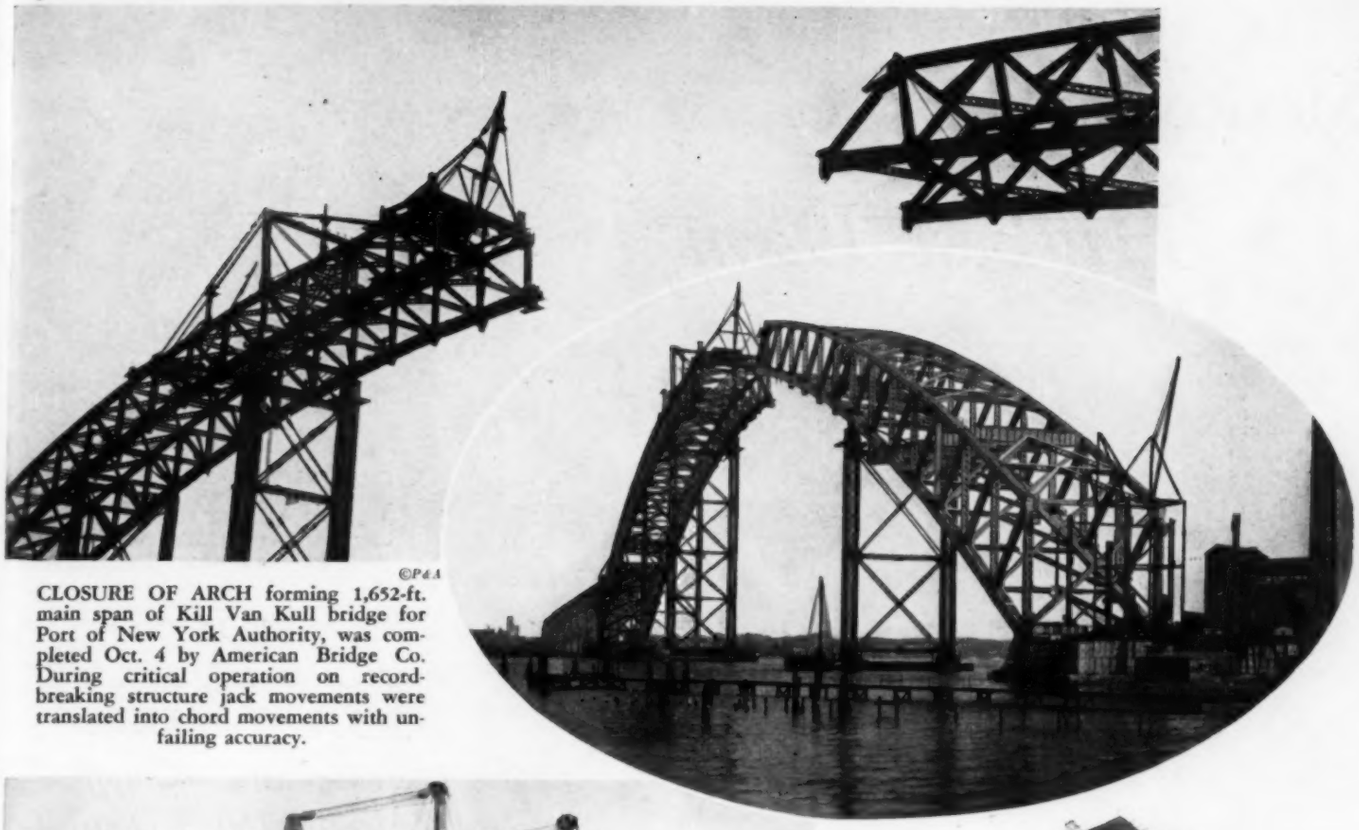
TO SERVE BOULDER CANYON PROJECT and Hoover dam on Colorado River the Merritt-Chapman & Scott Corporation starts $115,000 contract for grading 22-mile railway spur for Union Pacific Railroad from Las Vegas, Nev., to construction camp at Summit.

This Month's NEWS REEL

METAL BASE FOR BRICK PAVEMENT. Both corrugated and flat sheets of Armco iron are placed to form subgrade for experimental brick-surfaced road in Sangamon County, near Springfield, Ill. Thin sand-mastic cushion course supports brick.

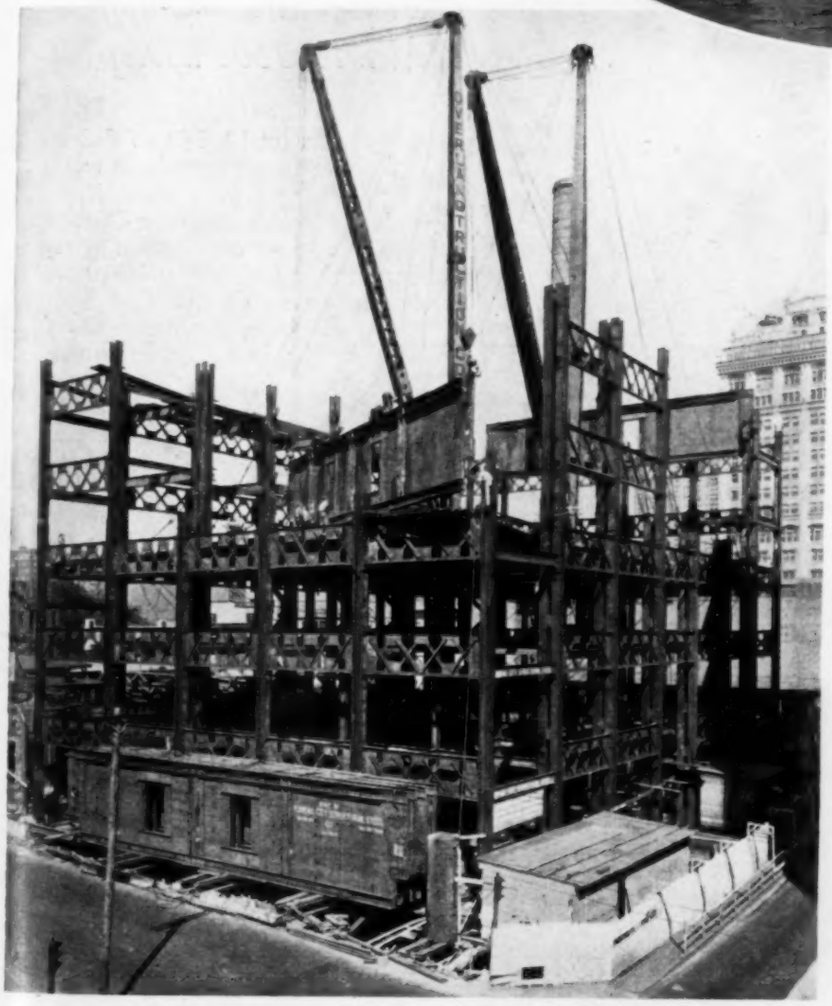
LAST STEELWORK for main structure of 85-story Empire State Building, New York, is marked by flag-raising ceremony 1,048 ft. above street level.

MEMORIAL TO GEORGE WESTINGHOUSE, dedicated Oct. 6 in Schenley Park, Pittsburgh. Monument of Norwegian black granite and gold-leafed bronze, made possible by contributions from 55,000 employees "who served with him in the army of industry," comprises a figure of American Youth facing central and side panels commemorating the achievements of the great inventive genius and industrial leader.



©P&A

CLOSURE OF ARCH forming 1,652-ft. main span of Kill Van Kull bridge for Port of New York Authority, was completed Oct. 4 by American Bridge Co. During critical operation on record-breaking structure jack movements were translated into chord movements with unfailing accuracy.



64-TON GIRDERS, 15-ft. deep, are erected by guy derricks for Kansas City Power & Light Co.'s new 32-story office building, tallest in Missouri. Kansas City Structural Steel Co. fabricated and erected steel for Swenson Construction Co., general contractor. Foundations by Long Construction Co. Architects, Hoit, Price & Barnes, of Kansas City, Mo.

©Wide World

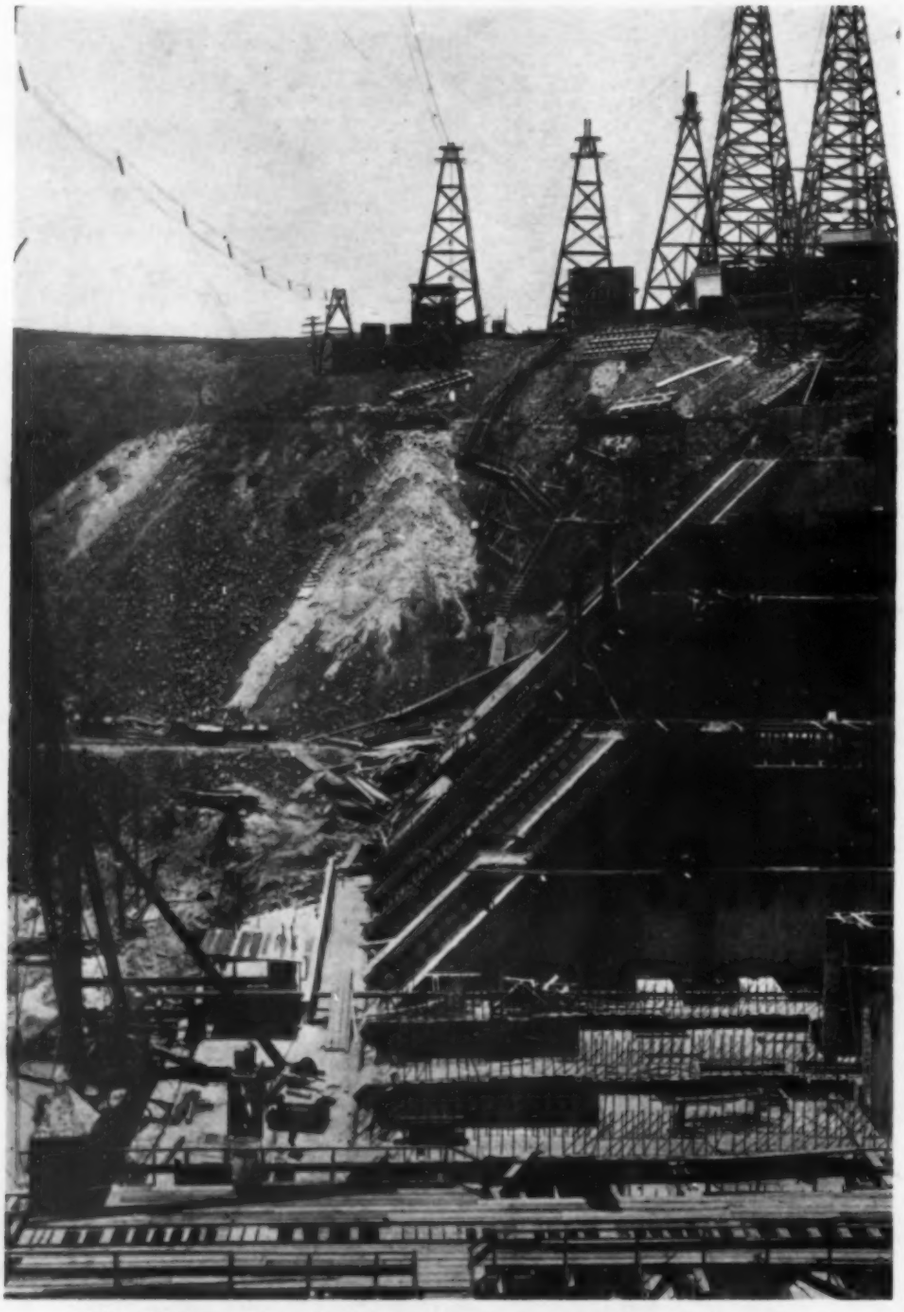
SKYSCRAPER COLLEGE nears completion. Cathedral of Learning for University of Pittsburgh is 42-story steel frame and masonry structure.

Mexico Builds

Highest Dam

of Ambursen Type

CHARLES P. WILLIAMS *(left)*, consulting engineer of Los Angeles, and JOSE GOMEZ TAGLE, resident engineer for Mexican Government.



FIVE CABLEWAYS, each of about 1,000-ft. span, extend across the gorge at the damsite to handle concrete, lumber, forms and excavated material. Buttresses are supported by a special foundation arch which transfers load to abutment rock at sides.

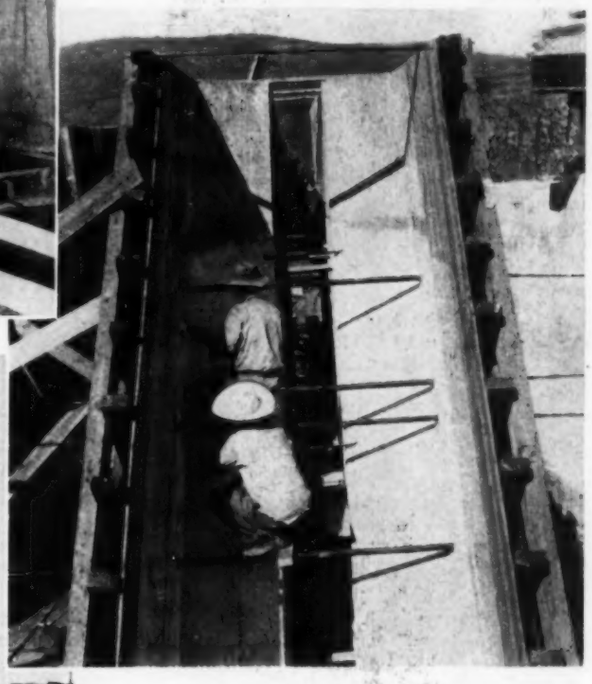
Rodriguez Structure, of Concrete, Extends 240 Ft. Above Lowest Foundation—Cutoff Wall Is 150 Ft. Deep

WITH a total height of 240 ft. above lowest foundation and a cutoff wall more than 150 ft. deep, the Rodriguez dam near Tijuana, Mexico, now under construction by the Ambursen Dam Co., will be the largest Ambursen type structure ever built. The dam will be approximately 2,200 ft. long at the crest and will store 110,000 acre-ft. of water for an irrigation development of the Mexican government in the Tijuana River valley. A fault revealed by foundation excavation has required a unique foundation treatment of more than usual interest.

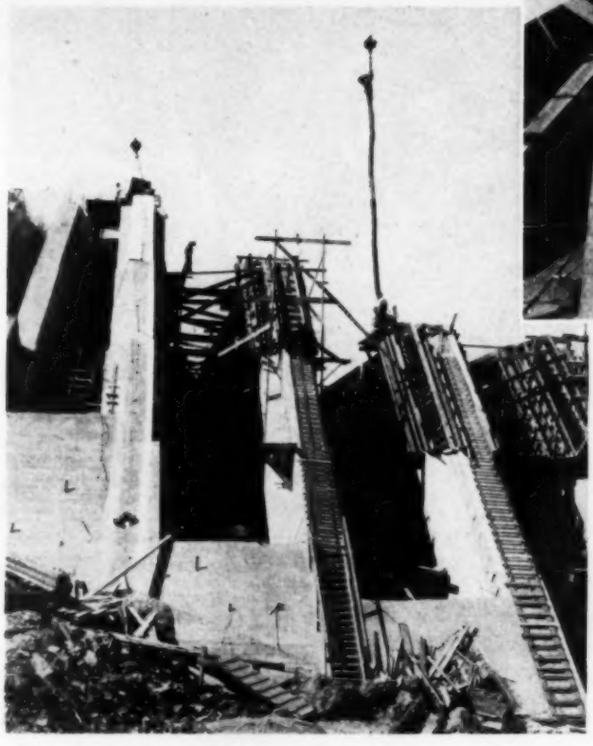
Contract Provisions—Contract for the structure was awarded in February, 1928, and among other provisions it required that 80 per cent of all employees should be Mexicans. In addition, all expenditures were required to conform to a monthly rate of payment which, for the first period, was about $120,000 per month but since January, 1930, has been $60,000 per month. Common labor wage is $2.25 per day and the crew under present money allotment averages about 320 men, although a maximum of 450 has been employed.

At the Rodriguez site, which is about 27 miles southeast of San Diego, Calif., and 9 miles east of Tijuana, Mexico, the Tijuana River has a drainage area of 940 square miles with an extremely seasonal flow featuring

FORMS ARE CLEANED *(below)* before each 15-ft. lift of buttress concrete is poured. Forms are metal lined. Taper bolts shown are later driven out.



CONCRETE STRUTS *(above)*, poured in place between buttresses, have their ends seated in asphalt-lined sockets to break monolithic connection with buttresses.



"ELEPHANT TRUNK" *(right)*, suspended from cableway, delivers concrete for struts between completed buttress sections. Concrete is being dumped from bucket in buttress at left.

large and flashy floods. The reservoir may be required to carry over periods of from 5 to 7 years when the annual runoff is extremely small. The estimated flood possibility is placed at 150,000 sec.ft. and the spillway will be designed for this quantity.

The dam site consists of a gorge about 130 ft. deep and 750 ft. wide at the top. Above the elevation of the top of the dam the canyon walls continue on gentle slopes. On the west bank a low saddle provides a natural location for the spillway structure which will return the flood water at right angles to streamflow about 300 ft. below the dam.

Preliminary investigations at the site by borings and 50 test pits at higher elevations indicated suitable foundation rock at reasonable depth. However, after actual foundation excavation work had commenced, the bedrock, when uncovered, proved to be considerably broken and unsuited for the support of the extremely high buttresses. In addition, a more serious difficulty was the discovery of a pronounced fault about 20 ft. wide parallel to the stream along the east abutment. Because of these conditions, a more thorough geological examination was made and it was reported that, although the fault was a serious weakness, there were no signs of recent movement and, considering the work already done at the site, condemnation of the site was not considered justified.

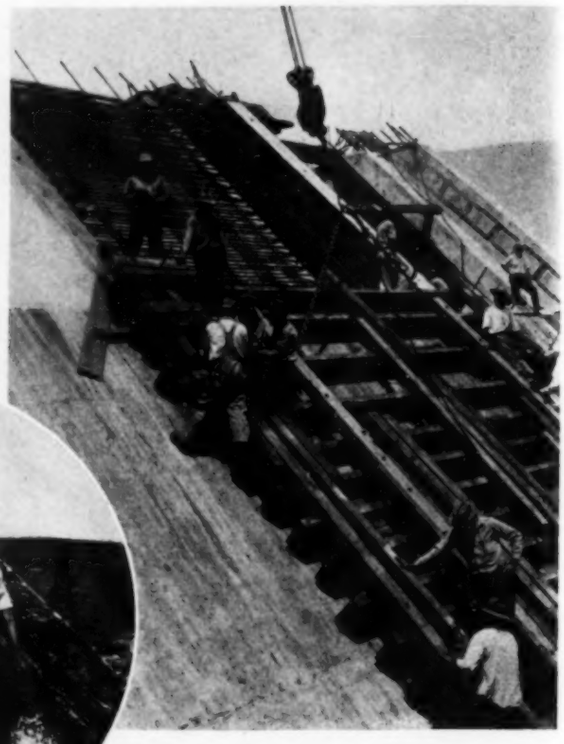
Excavation for Cutoff Wall—Excavation in open trench for a cutoff wall at the upstream toe was about 180 ft. long and 11 ft. in width. After excavating about 25 ft. in depth, difficulty was experienced in holding the sides of the trench, and meanwhile, the uncovering of the fault indicated that this cutoff would have to be extended to a considerable depth. For this reason, it was decided to undertake a most unusual method of constructing the rest of the wall. Leaving eleven holes for shafts, the rest of the trench was filled with concrete. Through these eleven shafts the excavation was extended downward over the whole area of the cutoff wall, following ordinary mining procedure. After excavating a lift of from 10 to 15 ft., forms for the continuation of the shafts were set and the rest of the excavation filled with concrete.

This process has continued to a depth of 150 ft. below streambed, and the sound rock has narrowed in the cutoff until it is only about 90 ft. long. The fault has continued down almost vertically and the depth to which the cutoff will be carried in this fault is undecided, but a depth of 300 ft. may be reached. Grout holes have been drilled into the rock at the sides of the cutoff wall and a double row will be left in the bottom after excavation has been completed. Finally, the shafts will be filled with concrete and the grouting done under high pressure.

Another unusual foundation feature is the use of an arch to carry the four

H. J. HOARD *(left)*, superintendent, and S. E. ROCKWELL, resident engineer, for Ambursen Dam Co.

FORMS *(right)* for reinforced concrete deck slab of dam are placed by one of the cableways.



ASPHALT PUTTY *(below)* is smeared on joint between deck slab and corbel of buttress.

RECESSED JOINT between buttress and deck is new feature of Ambursen dam design. Workmen are bolting on timbers to support lower forms for deck.

buttresses located in the streambed and transfer this load to the sound rock in the abutment. This design was required because of the inferior rock uncovered in the streambed and the fact that at least one of the buttresses would rest over the fault. As a preliminary to this arch construction, the entire streambed from upstream to downstream face of the dam, a distance of about 210 ft., was filled with concrete with its upper surface curved to form the under side of the arch.

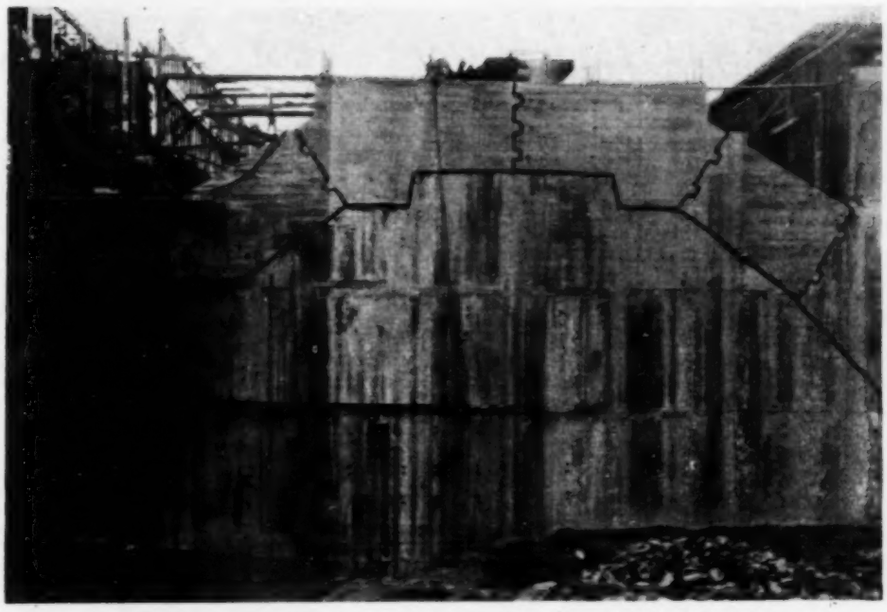
Arch Construction—On this concrete, as a foundation, the arch extending the entire distance under the dam was built of unreinforced blocks of concrete. An oiled joint was used between the arch and foundation concrete to permit arch action. On this arch four buttresses will rest and the design thus provides that the streambed foundation rock will take as much of the load as it can sustain and any settlement will transfer the remainder by arch action to the abutment rock. Immediately above the arch, concrete ribs 5 ft. thick on 20-ft. centers extend between the rock walls up to streambed level. These ribs are integral with the lower part of the buttresses, dividing the structure at this elevation into practically square cells.

Construction Equipment—An aggregate washing and batching plant of 500-cu.yd. capacity (8 hr.) is located immediately downstream from the dam. The material, which is principally the gravel dumps resulting from the 91,000 cu.yd. of foundation excavation, is dragged to this plant by a Sauerman cableway excavator. Most of this foundation excavation was carried on with power shovels and trucks.

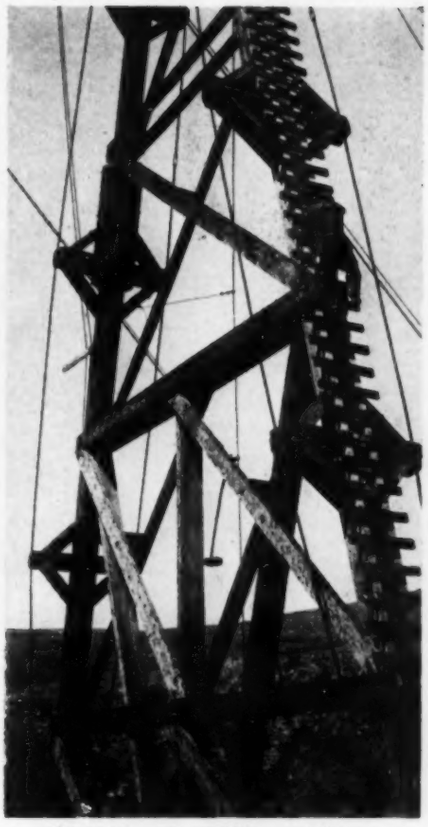
From the Stephenson-Adams aggregate plant the material is transferred by belt conveyor to the bunkers above the mixing plant. The aggregate is batched by volume and mixed in two 1½-yd. mixers, one a Smith, the other a Ransome. These 1½-yd. batches of concrete are hauled by Milwaukee locomotives and deposited either directly by chute or transferred by cableway to the place of pour. The equipment permits the pouring of about 400 cu.yd. of concrete in 8 hr. A 15-ft. lift in the lower section of one of the large buttresses requires the pouring of about 425 cu.yd. of concrete and is carried on in one continuous operation. The total cubic yardage estimated in the structure is 190,000.

A railroad within a short distance of the site made transportation problems negligible. Electric power is supplied by an 11,000-volt transmission line, about 10 miles long, built from existing sources to the main compressor plant. This plant consists of three Ingersoll-Rand compressors (Imperial type 10) driven by three electric motors aggregating 575 hp. In addition to this use, electrical energy is used extensively around the camp and for general construction purposes.

The major features of equipment are the five cableways of about 1,000-ft. span extending across the gorge. These cableways are used continuously for practically all construction operations in the transportation of lumber, concrete, forms and excavated material. The two largest are suspended from



ARCHED FOUNDATION of concrete blocks supports four of the highest buttresses over inferior rock in streambed, transferring load to sound abutment rock.

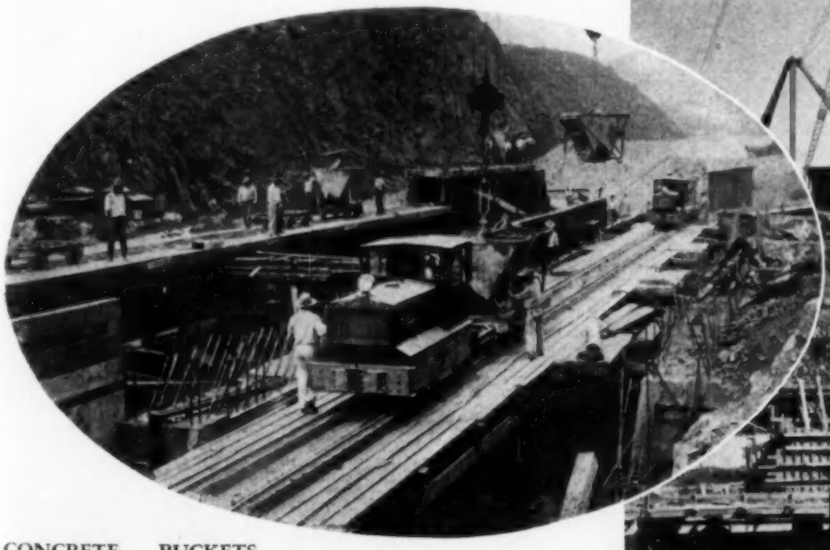


SPECIAL BRACING reinforces spliced joints in legs of cableway towers.

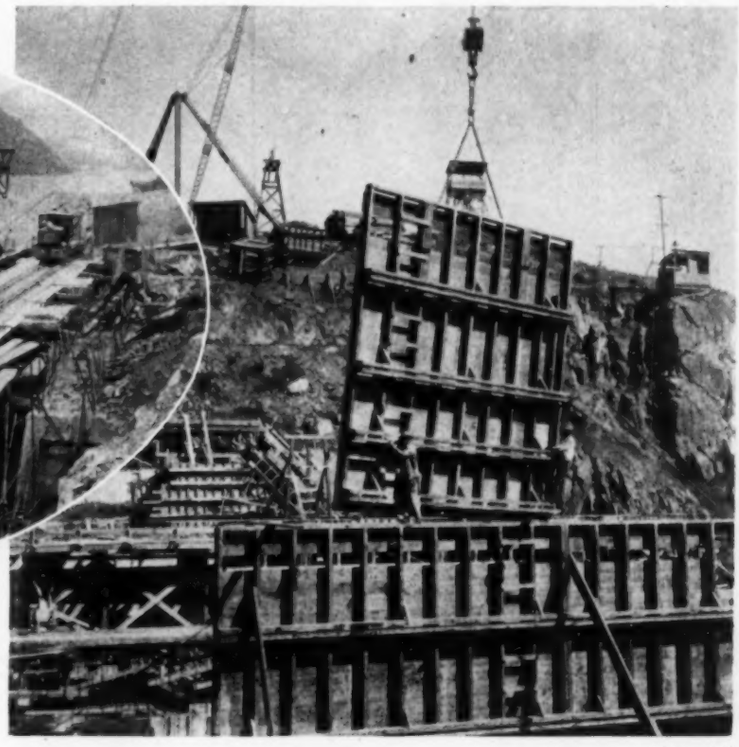
twin towers, 165 ft. high and have a capacity of about 12 tons each. They are of Lidgerwood construction and operated by electric motor. The three smaller ones, one Lidgerwood and two Mundy, are air-operated.

Size of Structure—Because of the unprecedented size of this Ambursen dam as compared to all previously built structures of this type, a few of the principal dimensions might be of interest. Following standard Ambursen practice, the slope of the upstream face is 1 to 1 with the slabs varying in thickness from 64½ in. at the bottom to 25 in. at the top of the buttresses. The buttresses are 3 ft. thick at the top and increase to a thickness of 7 ft. 9 in. near the elevation of the foundation arch crown.

Organization—The Rodriguez dam is being built by the national government of Mexico and the Northern District of Baja, Calif., as a joint irrigation development. Ignacio Lopez Bancalari is chief executive of the National Commisson of Irrigation and is represented in the district and on the Rodriguez project by Jose L. Favela. Chas. P. Williams, Los Angeles, is consulting enginer for the National Commission, and is assisted by Jose Gomez Tagle as resident engineer for the Mexican government. A. J. Wiley and F. A. Noetzli with Mr. Williams have acted as a consulting board on problems of foundation and design. The Ambursen Dam Co. has the contract for the design and construction of the dam and is represented on the site by H. J. Hoard, superintendent, and S. E. Rockwell, resident engineer.



CONCRETE BUCKETS *(above)* delivered on cars by industrial locomotive, are picked up by the cableways.



FORM HANDLING *(right)* is facilitated by cableways. Panels for 15-ft. lift are 20x20 ft.

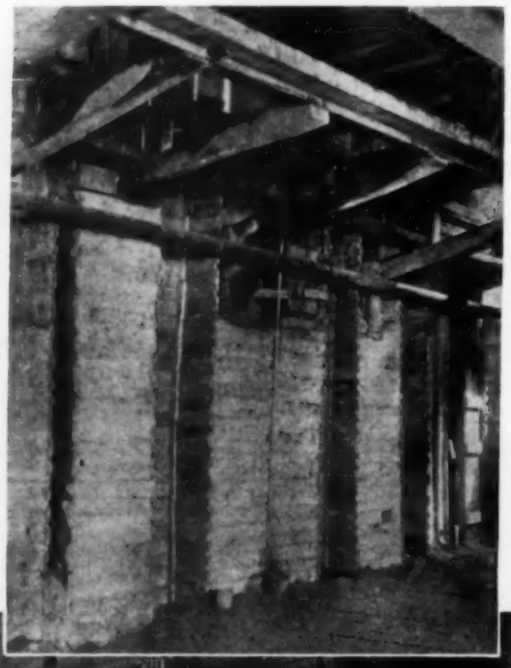
Building New York's

Piers and Piles Underpin Buildings and Existing Subway Structures

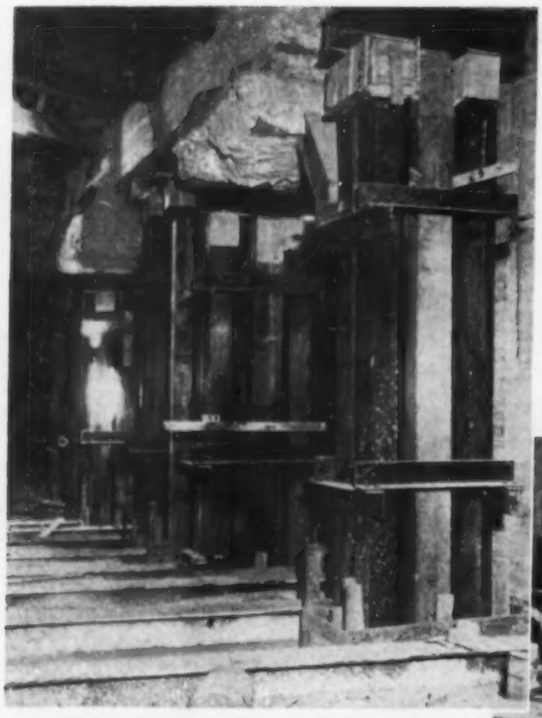
TWO types of underpinning commonly support buildings and existing subway structures which intersect or stand adjacent to open-cut subway construction. To carry building loads to safe depths in dry earth, contractors usually sink box-sheeted pits and pour concrete piers in them. When the piers must be located close together, as in building an underpinning or retaining wall, the subway builders install alternate piers, distributing the first pits at safe intervals and filling the gaps with additional piers constructed after the completion of the first set.

In water-bearing earth, sheeted pits are not feasible, and the contractors usually drive steel-shell piles with hydraulic jacks, excavate the shells and fill the piles with concrete. For this work, the inverted hydraulic jack, as developed by Spencer, White & Prentis, Inc., for the Marcus Contracting Co., Inc., is suspended from a bracket on a steel beam. It is gaining favor as it remains fixed in position for the entire pile-driving operation. Cylinder piles have proved adaptable to many conditions, and a number of subway constructors prefer to use them in places where concrete piers also would be practicable as a method of support.

SHEETED PIT is sunk prior to subway excavation for concrete pier to support column at building entrance. Del Balso Construction Corporation, contractor.



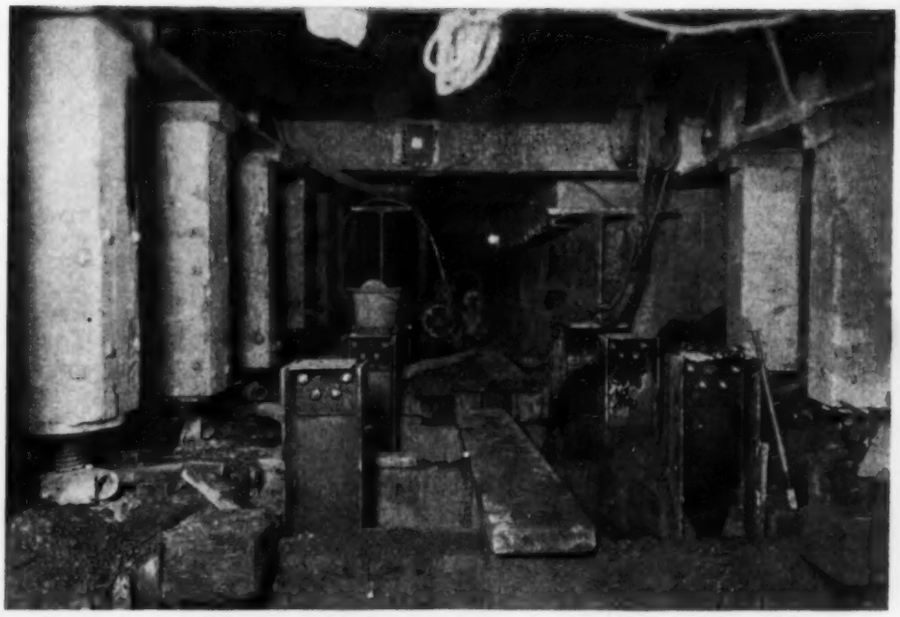
CONCRETE PIERS (*left*), carried below subgrade in sheeted pits prior to excavation, carry wall of building on Del Balso Construction Corporation section. When closely spaced, piers are constructed alternately so that building always has safe supporting foundation.



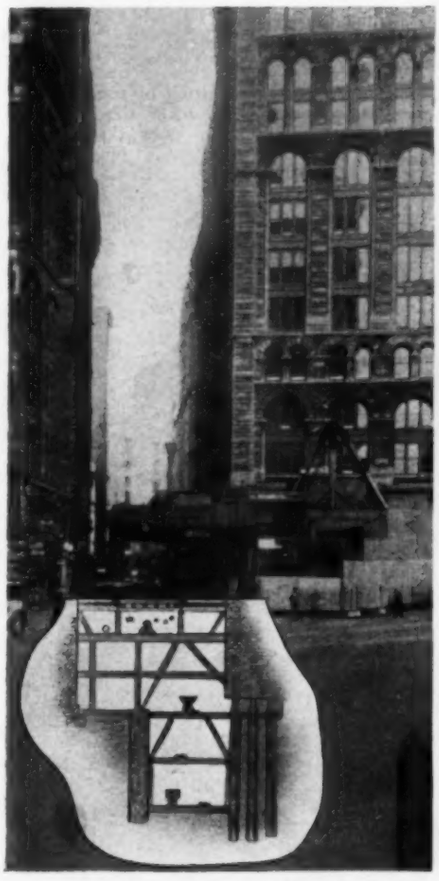
UNDERPINNING TOWERS, made up of four H-sections resting on pipe-pile foundations, support heavy steel-and-concrete girder carrying columns of sixteen-story building. Del Balso Construction Corporation constructed girder, sank pits below subgrade, drove steel shell piles in bottoms of pits, erected towers and transferred load to towers before starting subway excavation. Concrete blocks at tops of H-sections contain screw jacks.

TO CONSTRUCT RETAINING WALL prior to opening subway trench, Del Balso Construction Corporation first sinks alternate pits below subgrade and completes piers in these pits before excavating intermediate pits to fill gaps in wall.

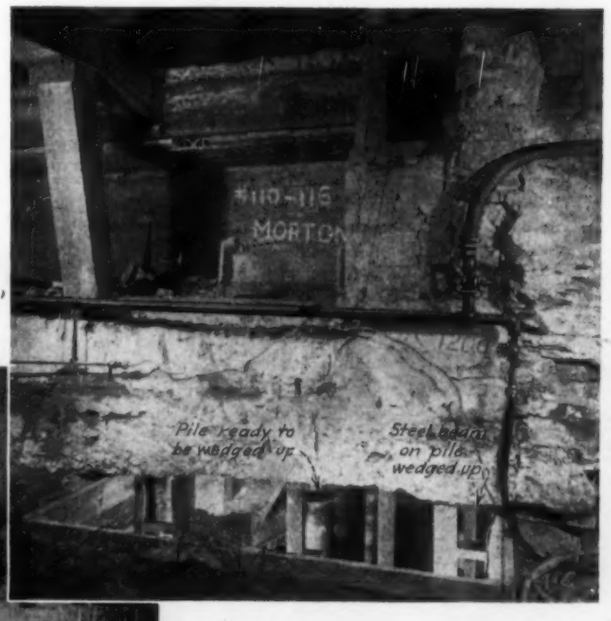
Subways—IV



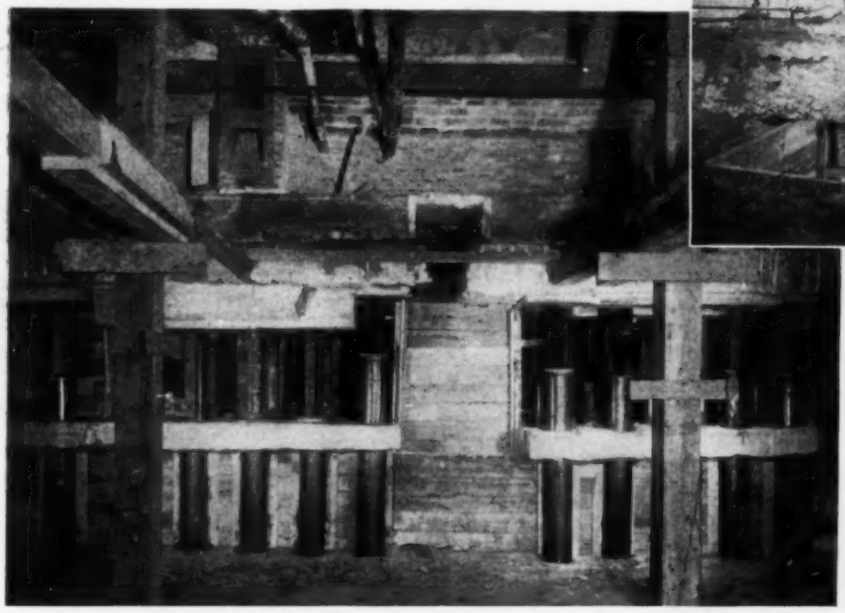
GOING UNDER EXISTING SUBWAY STRUCTURE with trench 60 ft. wide, Oakdale Contracting Co., Inc., drives five drifts, one at a time installing two temporary beams supported by screw jacks in each drift. H-beams then are driven to refusal, penetrating 30 to 40 ft. below subgrade, and runner beams are placed on H-beams. Load is transferred to these permanent beams.



CONCRETE WALL AND CYLINDER PILES installed by Marcus Contracting Co., Inc., Spencer, White & Prentis, Inc., works manager, sustain tall buildings along deep subway trench on Nassau St. subway section. Concrete wall is constructed by means of box-sheeted pits sunk from upper level. Two lower photographs on this page illustrate method of installing piles.

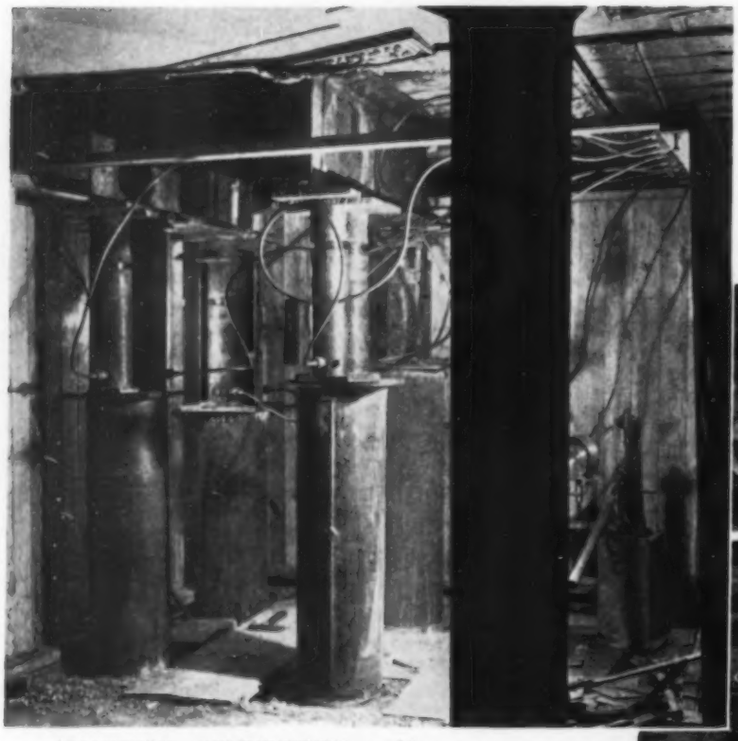


START OF UNDERPINNING OPERATIONS under building supported on box girders resting on rubble masonry foundation. After footings under box girders have been tied together by reinforced concrete slab, a pit about 6 ft. deep is opened under footing to drive pretest pipe piles. Piles are driven in short sections, with sleeve couplings, are blown out with compressed air and are filled with concrete. Arrows indicate steel beam on one pile wedged up against concrete slab and second pile ready for wedging. Spencer, White & Prentis, Inc., works manager for Marcus Contracting Co., Inc., contractor.

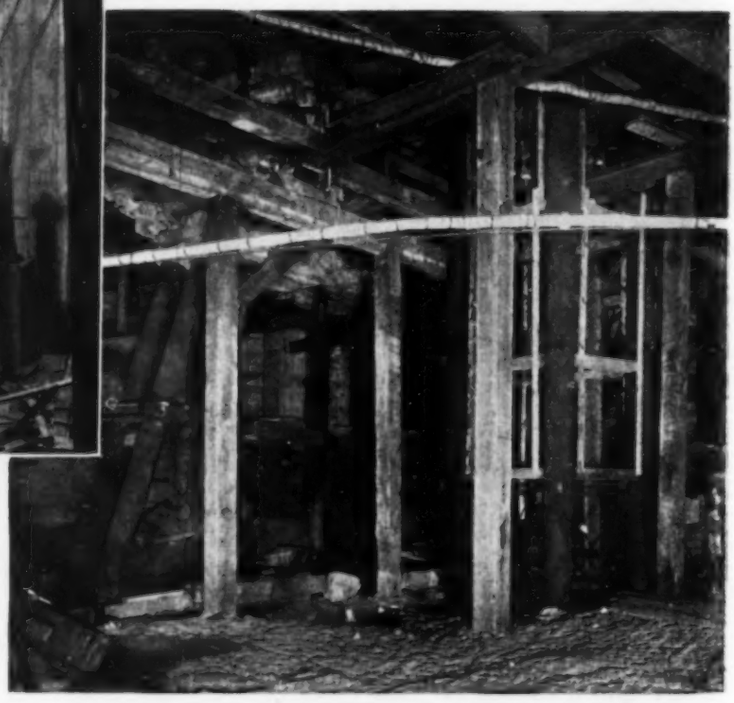


CLUSTERS OF PIPE PILES under building at right are secured against possibility of movement by concrete collars. As excavation goes down, Spencer, White & Prentis, Inc., works manager for Marcus Contracting Co., Inc., installs sheeting between piles.

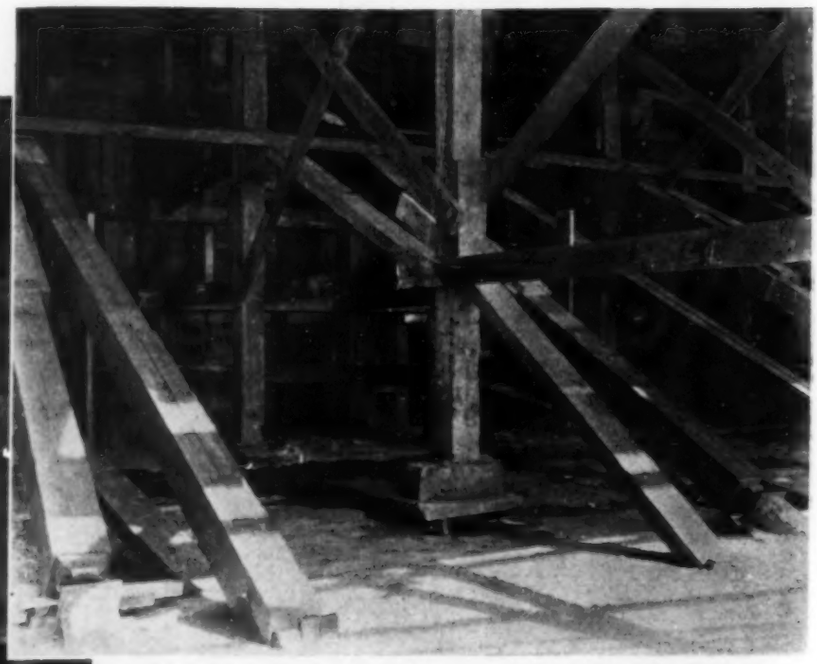
Building New York's



TOWER BRACING *(below)*, consisting of timber struts and steel bands with turnbuckle tierods, laces piles together as excavation goes down. At left are two pipe piles, supporting bridge column, driven on batter to permit subway construction without interference.

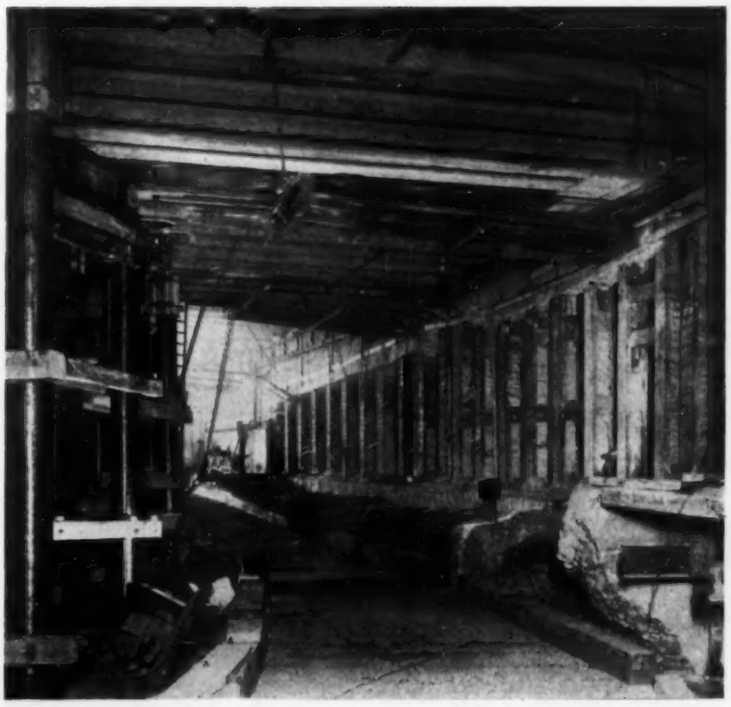


MANIFOLD CONNECTION enables one pump to operate eight jacks driving four piles. I-beams have been inserted between two jacks on each of two piles *(above)*, and wedges are ready for driving between I-beams and H-beams above to transfer load from jacks to piles. Two piles on right are ready for I-beams. These piles are used to support roof of unused double-track subway connection and column of Brooklyn Bridge approach viaduct directly above. Marcus Contracting Co., Inc., contractor; Spencer, White & Prentis, Inc., works manager. WHERE NEW SUBWAY PASSES UNDER EXISTING TUBE *(below)*, on contract section of Mason & Hanger Co., Inc., and Silas Mason Co., concrete cradle in center core of new structure and steel-shell concrete-filled piles support tube which has cast-iron exterior shell.

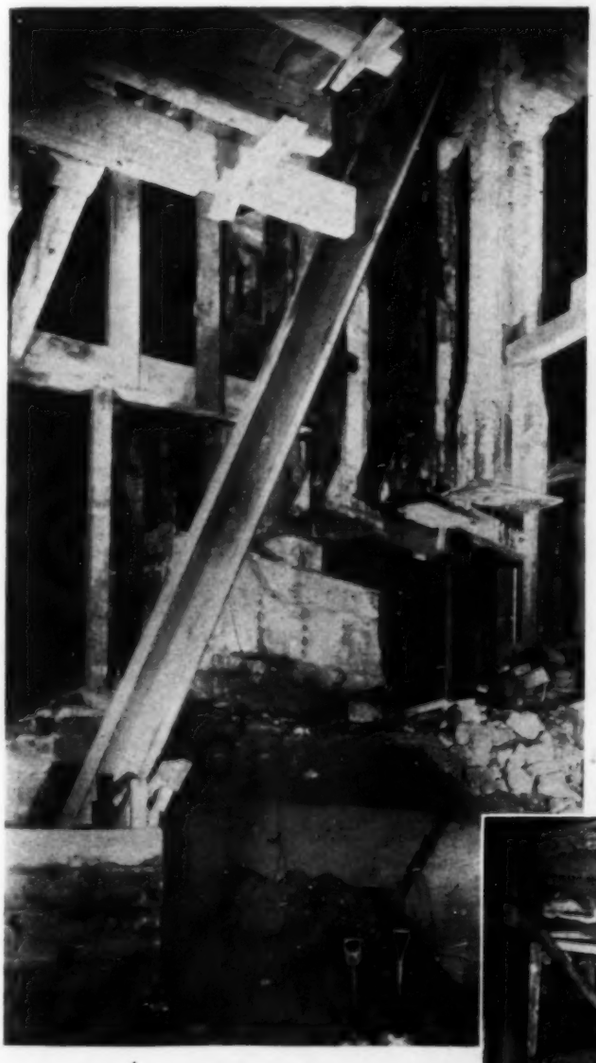


TIMBER RAKERS, jacked against underpinning piers, prevent movement of piers. Necaro Co., Inc., takes up any movement with screw jacks at foot of rakers.

Subways—Part IV (continued)



NEW SUBWAY PASSES THROUGH UNUSED DOUBLE-TRACK CONNECTION of existing subway system. Contract awarded to Marcus Contracting Co., Inc., states that connection is not to be excavated but is to be cut to outline of new subway structure. Connection is of substantial construction supporting portion of Brooklyn Bridge approach, elevated railway columns, trolley tracks, and roadway. To support roof of connection, approximately sixty 16-in. steel-shell concrete-filled piles were driven, each pile carrying load of 90 tons or more. At left, piles are driven under load. At right, columns of connection are exposed preparatory to driving piles.



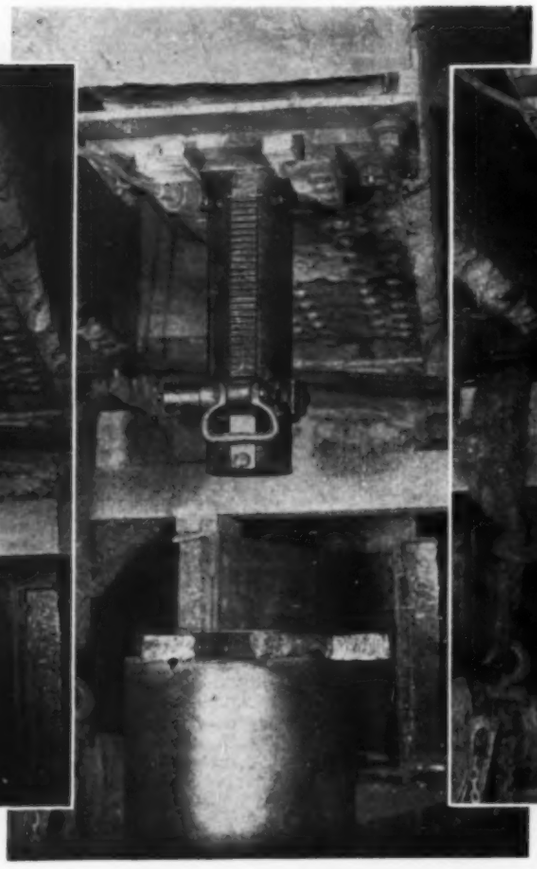
TO CLEAR OLD GRILLAGE and allow placing of new grillages, Bethlehem 14-in. H-section raker beam 161 lb. on a batter of 4 in. per foot resting on 4x4x8-ft. concrete footing carries column load of 750 tons at one point of intersection with unused double-track connection. Raker beam is welded to column. Angles used in making welded connection have holes drilled in them to match rivet heads on column, allowing angle to make full contact with column. As part of welding operation, these holes are filled with metal, fusing them to rivet heads and column.

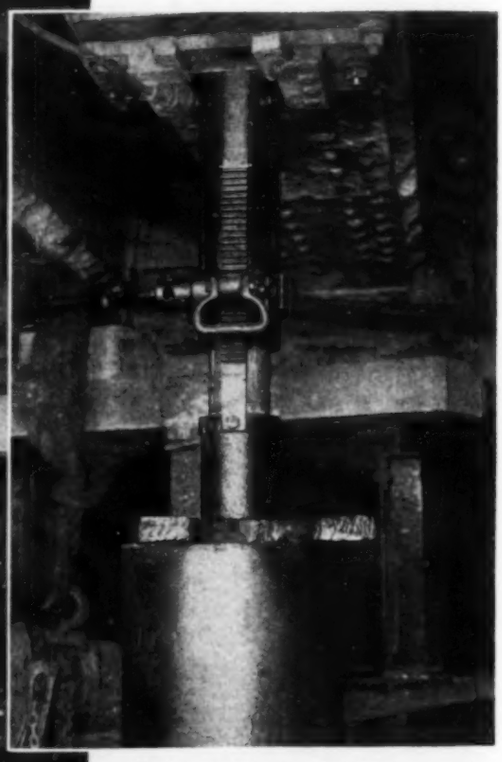
NEW SUBWAY STEEL is erected through unused double-track connection after roof load has been transferred to piles and old subway columns and grillages have been removed. Wood ramp is used for hauling spoil and materials.

Building New York's

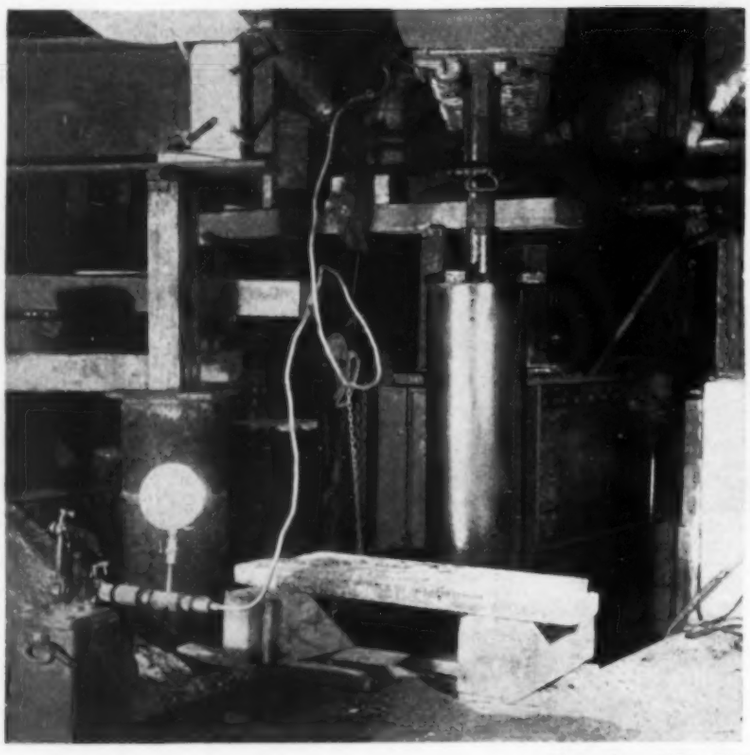
Driving Steel-Shell Pile With Inverted Hydraulic Jacks

1 BRACKET, attached to lower flange of girder, is ready to hold inverted jack. Below is 16-in. steel shell which jack will drive. Spencer, White & Prentis, Inc., works manager for Marcus Contracting Co., Inc., contractor.





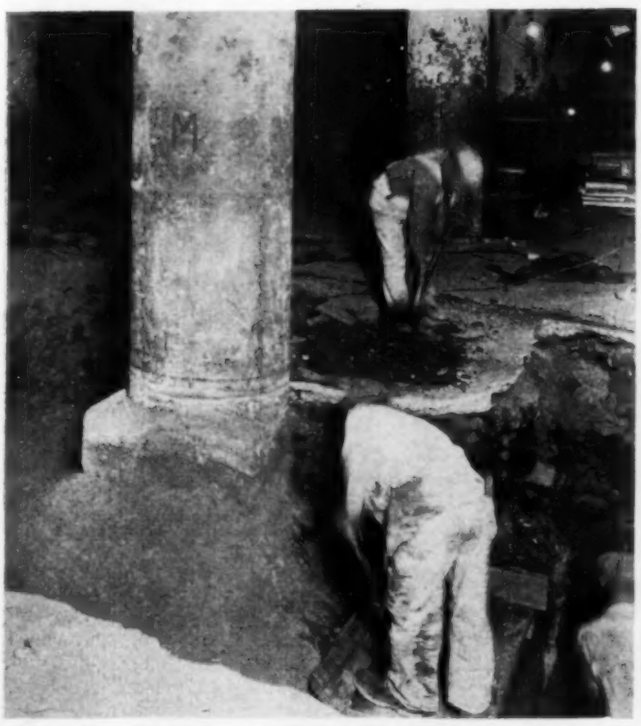
3 PRESSURE IS APPLIED to steel shell. Note steel cylinder under head of jack, of approximately same diameter as head. Rack-and-pinion device of Watson-Stillman jack returns ram to top position. Rack is bolted to head. Jack remains fixed in position during entire piledriving operation, as it need not be removed when new section of steel shell is being placed on pile.



2 INVERTED JACK *(top, center)* is suspended and wedged in bracket and 1-in. plate is placed on top of 16-in. pile.

4 HAND PUMP *(left)* applies pressure to hydraulic jack through flexible copper pipe. Pressure gage indicates pounds per square inch exerted. During testing operations, total load on pile is known.

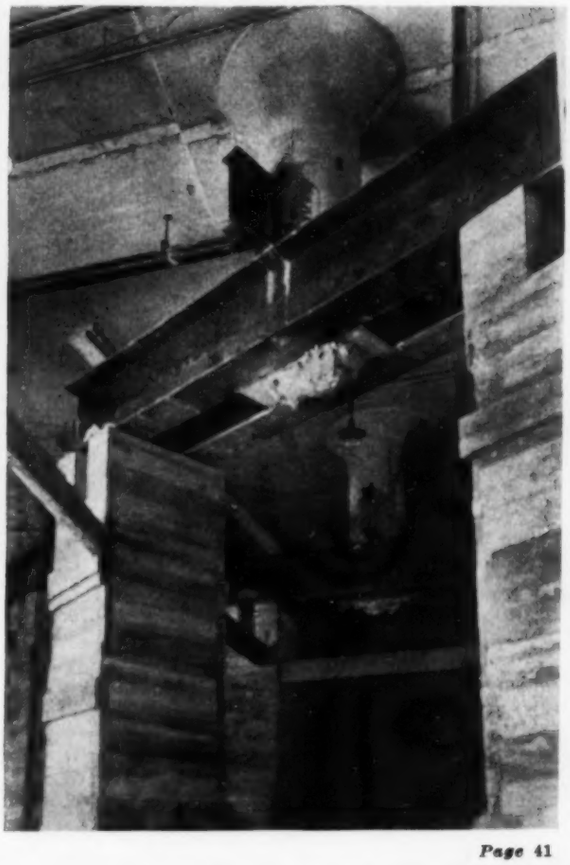
Underpinning Concrete Columns



1 COLUMNS MUST BE CUT OFF ABOVE FOOTINGS. Necaro Co., Inc., sinks pits alongside footings. Workmen sheet pits as they go down.

2 CONCRETE PIERS are poured in sheeted pits to height above level of proposed column cut-off.

3 NEEDLE BEAMS, inserted through columns, transfer column loads to pairs of needle beams resting on concrete piers.

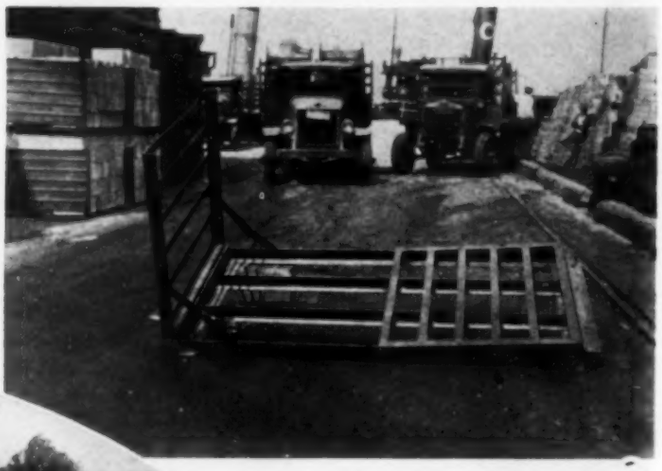


4 COLUMNS ARE CUT OFF below needle beams. Concrete piers are so placed and so constructed as not to interfere with erection of subway steel.

Getting Down to DETAILS

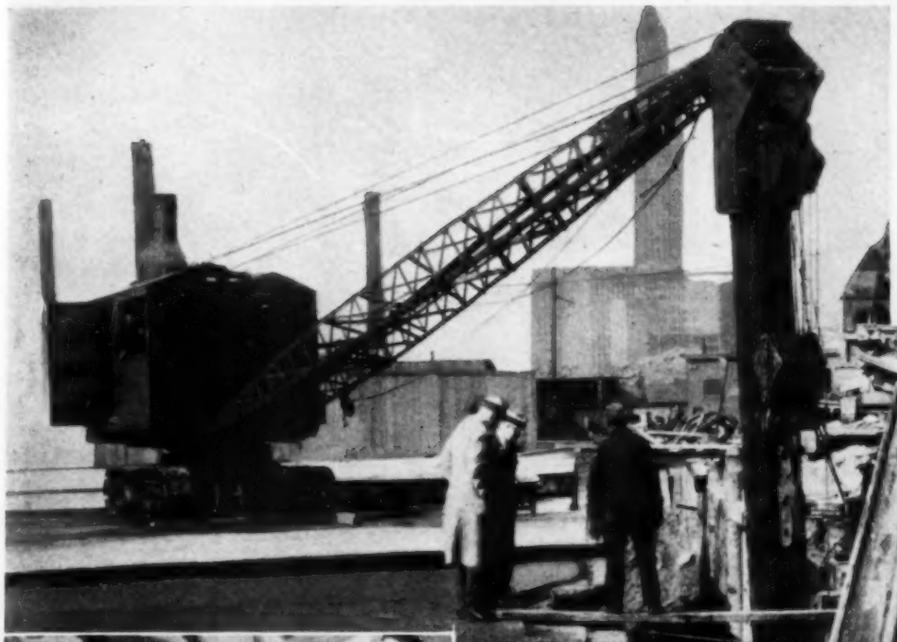
Close-up Shots of Job Methods and Equipment

BRIDGE GIRDERS FORM DERRICK CAR. In building the Rio Doce bridge in Brazil, Soares de Sampaio & Cia., Ltd., mounted on railroad trucks the pair of 85-ft. girders intended for the last of the 26 spans of the crossing and by adding a cantilever truss 20 ft. long produced an erection traveler with a reach of 48 ft. The last span was made with the girders from the dismantled traveler.

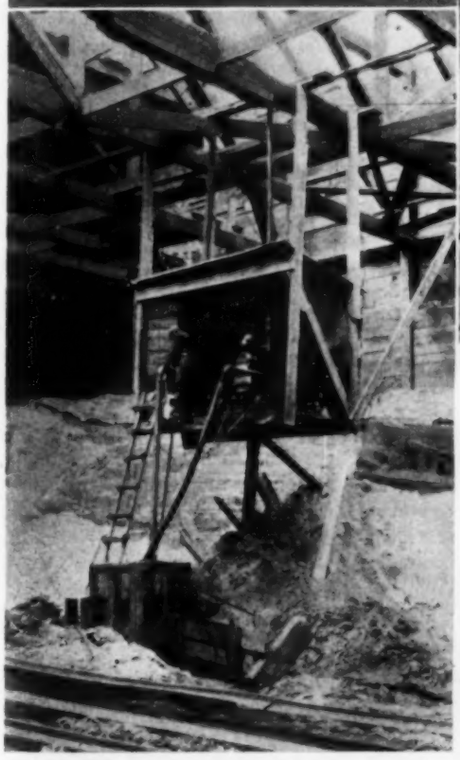


COLLAPSIBLE STEEL CRATES *(above, left)*, 3x7 ft. in plan and 4 ft. high, aid Fullerton Trucking Co., of New York, in making quick motor truck deliveries of hollow building tile shipped from plant of National Fireproofing Co. at Perth Amboy, N. J. Each crate carries 2 tons of material. Four crates form a truck load.

TO DISTRIBUTE STONE *(left)* for sewage treatment works at Alliance, Ohio, W. E. Sexton, the contractor, made effective use of industrial railway haulage. Trains of three cars, hauled by a 4-ton Plymouth gasoline locomotive, operated on 350 ft. of track with 35-ft. radius curves and 7 per cent grades.



FOR PULLING STEEL SHEET PILING driven 25 ft. deep in clay at the Central Ave. bridge, Cleveland, the David Lowensohn Construction Co. rigged the boom of its McMyler-Interstate crane with a 12x12-in. timber post 30 ft. long reinforced against buckling by full length strips of 6-in. angle iron bolted to each corner. Swivel joint of steel plates carries 6-wheel pulley block and fall, multiplying pull by line from crane drum.

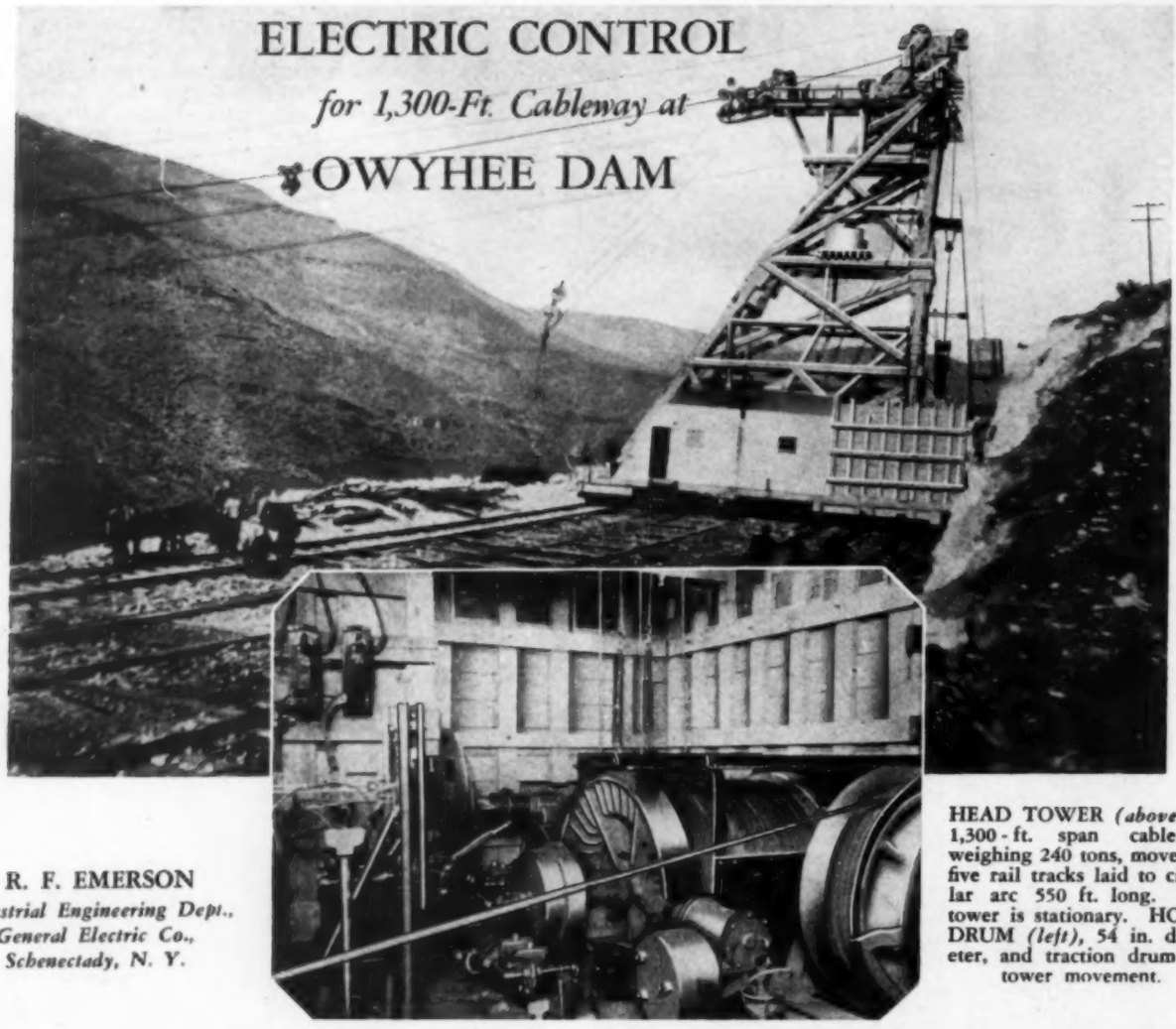


FOR UNWATERING SUBWAY CUTS in New York the Corson Construction Corporation mounts electrically driven pumps on platforms suspended from timbering. Suction lines extend into gravel filled sumps excavated below subgrade.

FOR HAULING BULK CEMENT. This special closed body on a Sterling truck is used by Carl Southworth on the Northwestern Electric Co.'s big dam at Ariel, Wash. The body capacity is 63 bbl. of cement. Loading is done by canvas tube; discharge is through a canvas spout, as illustrated.

ELECTRIC CONTROL
for 1,300-Ft. Cableway at
OWYHEE DAM

By R. F. EMERSON
Industrial Engineering Dept., General Electric Co., Schenectady, N. Y.

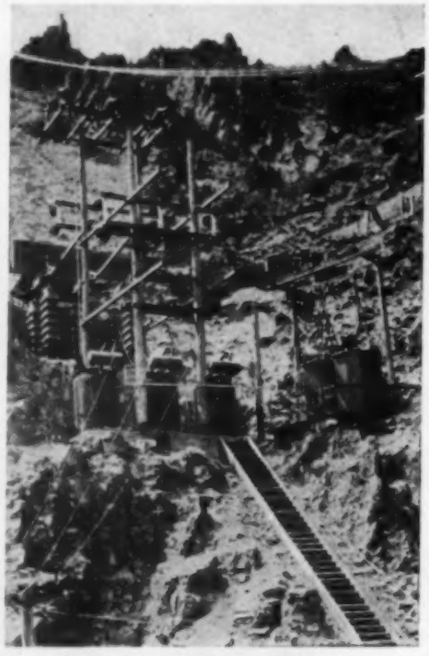


HEAD TOWER *(above)* of 1,300-ft. span cableway, weighing 240 tons, moves on five rail tracks laid to circular arc 550 ft. long. Tail tower is stationary. HOIST DRUM *(left)*, 54 in. diameter, and traction drum for tower movement.

IN THE construction of the Owyhee dam for the U. S. Bureau of Reclamation in Oregon a 1,300-ft. span cableway has been installed for handling excavation and concrete. The structure is 525 ft. from lowest foundation to top, 835 ft. long on the crest and will cost $6,000,000. It requires 540,000 cu.yd. of concrete, to be handled by the cableway.

The tail tower is stationary; the head tower, on the opposite side of the river, can be operated at 200 ft. per minute on five rail tracks laid to a 550-ft. arc of 1,300-ft. radius. An 8-cu.yd. bucket travels back and forth on the cable at 1,200 ft. per minute or is lowered and raised vertically at a speed of 240 ft. per minute by power from a 400-hp., 600-r.p.m., 2,200-volt, wound-rotor induction motor. The movable tower weighs 240 tons and is propelled by a 75-hp., 900-r.p.m., 2,200-volt, wound-rotor motor. The tower travels on 17 pairs of 24-in. steel wheels. Both motors, together with necessary magnetic switches, and two 52-cu.ft. air compressors for furnishing air for brakes and clutches are located in the movable head tower.

For operating the motor equipment in the head tower 2,200-volt power is brought across the canyon by a three conductor insulated cable. This power



SUB-STATION, 3,000-kva., 66,000 volt, supplies electrical power for construction of Owyhee dam.

is fed direct to the 400- and 75-hp. motors. Transformers in the head tower step the voltage down to 440 volts for operating the compressor motors and for furnishing power to magnetic switches and clutch and brake solenoids. As far as possible, all 2,200-volt equipment is grouped in one part of the tower.

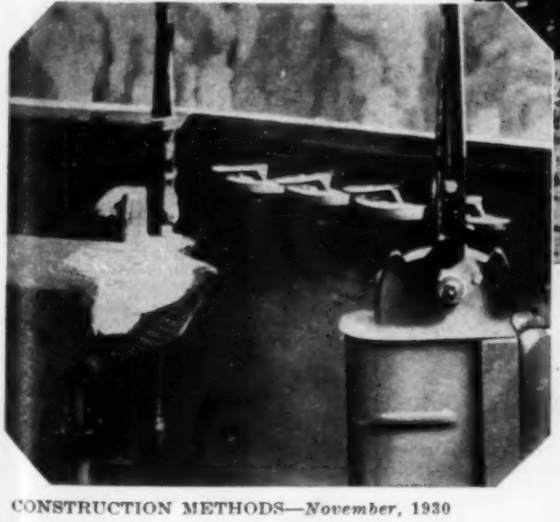
Operating Cab — In designing the cableway it was believed that the handling of concrete could be expedited if the operator were located, not in the head tower, but where he could have a full view of the cableway bucket. This was accomplished by suspending the operator's cab over the side of the canyon at the end of a 500-ft. steel cable. As the dam progresses, the cab is raised, thus maintaining the operator's view of all operations of the bucket.

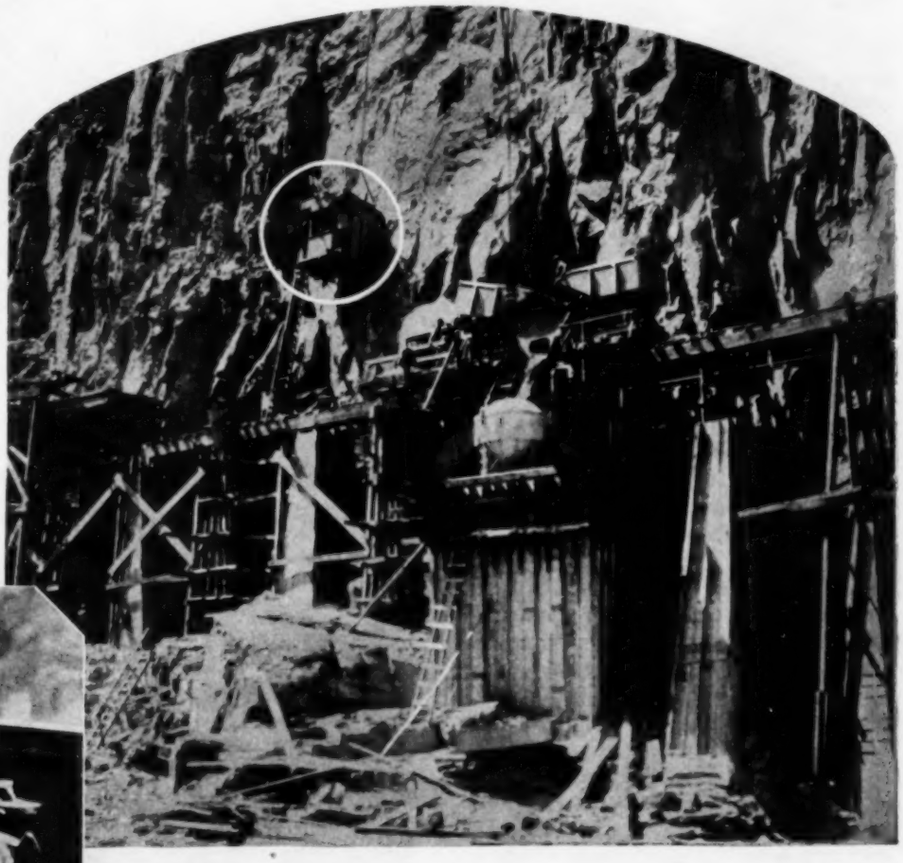
The cab contains two master switches, one for controlling the movements of the 400-hp. hoist motor, and the other for controlling the 75-hp. tower moving motor. There are also four controllers for the air-operated brakes and clutches. Putting the operator in this location made it necessary to run a multi-conductor cable con-

FROM AN 8-YD. BUCKET concrete is deposited from the cableway into the foundation for the dam.

taining 27 control wires 2,300 ft. long from the cab to the stationary tower and then across the canyon to the movable tower. Handling the cable in this way avoided the necessity of installing 27 trolley wires and current-collecting devices at the head tower. This bundle of wires is supported between the two cableway towers at short intervals from a steel cable. These wires carry only small control currents which actuate the various electro-magnetic switches in the movable tower. No main motor currents are brought to the operator's cab.

Limit switches are furnished to prevent over-travel of the moving tower. If the movable tower approaches too close to the extreme ends of the track a limit switch operates, making it impossible for the operator to move the tower in that direction.





CABLEWAY OPERATOR'S CAB *(above, in circle)* is suspended by 500-ft. wire cable along canyon side to provide clear view of concreting and other construction operations. CAB INTERIOR *(left)* showing master switches for hoist and tower moving motors.

Economy in upkeep of hoist brakes and clutches is obtained by "plugging" the motor; i.e., when moving the bucket, all retardation can be accomplished by reversing the power input to the motor until the motor has very nearly reached zero speed, after which the brake can be set to hold the load. This minimizes the wear and tear on the mechanical equipment.

The electrical manufacturer calculated the motor size with sufficient margin to make continuously repeated round-trips as fast as one round-trip in 1½ min., although this speed is faster than is attained in actual practice.

Besides the motors used for actually operating the cableway, there is a total of upward of 45 other motors used for driving conveyors, elevators, air compressors, and pumps in the mixing and screening plant, compressor room, machine shops, etc. All electric power comes from the sub-station.

When completed, the Owyhee dam will be notable as the highest in the world, although it will be surpassed by the proposed Hoover dam of the Boulder Canyon project on the Colorado River.

The general contractor for the Owyhee dam is the General Construction Co., of Seattle, Wash. The cableway equipment was furnished by the Lidgerwood Manufacturing Co., Elizabeth, N. J. The electrical equipment was furnished by the General Electric Co., Schenectady, N. Y.

Railroad Construction in Mountain Country—VII

Jackhammer Drills Drive Short Tunnels on 7-Mile Extension of Virginian Railway Branch

TUNNEL PORTAL. Heading has advanced less than 20 ft. Tipple will be installed to dump heading muck from mine cars into cars on lower track.

JACKHAMMER drills advanced the headings and took out the benches of three short tunnels, aggregating 1,800 ft. in length, which Boxley Brothers Co., Inc., Orange, Va., general contractor, recently completed on a 7-mile extension of a Virginian Railway branch—the Virginian & Western Railway Guyandot Line—in Wyoming County, W. Va. Grading work was sublet by the general contractor in separate sections to two concerns, the Sutton Co., Inc., of Ashland, Ky., and the F. C. Sammons Co., of Huntington, W. Va.

The Virginian & Western Railway Guyandot Line connects with the Guyandot River branch of the Virginian Railway near Itman, about 2½ miles west of Elmore, on the main line. It is planned to continue the Guyandot Line down the Guyandot River to connections, at Gilbert, Mingo County, W. Va., with the existing Logan division of the Chesapeake & Ohio Railway and with the Norfolk & Western Railway branch now being constructed from Wharncliffe to Gilbert.

The total length of the line will be about 42 miles. Track now has been laid on 24 miles, including the 7 miles just completed.

Tunnel Construction—Tunnels were driven by the top heading method through hard sandstone rock. Tunnel construction started at the east portal of the most easterly of the three tunnels, about ½ mile from the end of track previously completed. The first tunnel 825 ft. in length was the longest of the three. About 1 mile below it was the second, 375 ft. long; and, 2½ miles below the second tunnel, was the third, approximately 600 ft. in length.

The contractor installed a compressor plant at the east portal of the first tunnel to supply air for both the first and second tunnels. After the heading had holed through to the west portal, T. J. Brockman, superintendent, laid a 3-in. pipe line through the heading to operate the bench drills and mucking shovel, which worked in from the west portal, and extended the line to the second tunnel to supply air for drilling and mucking operations there.

The compressor plant consisted of two machines with a capacity of about 500 cu.ft. per minute each: an Ingersoll-Rand oil-engine 17x19-in. compressor, and a Rand steam-engine compressor. Headings of the tunnels

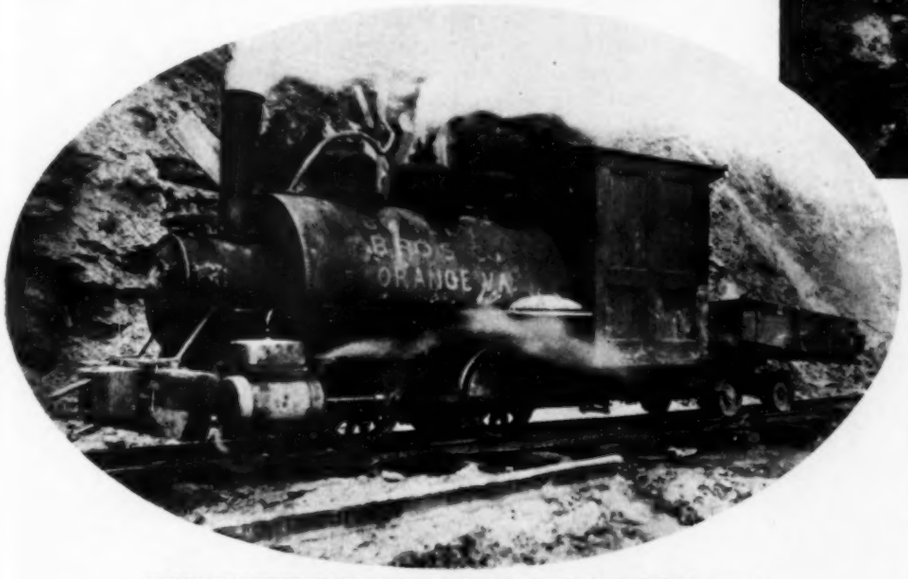
A. DOLE *(left)*, division engineer, Virginian Railway Co., and W. P. SUTTON, of Sutton Co., Inc.

SIDE-DUMP CARS have steel-lined bottoms which save time in handling sticky material by dumping clean. At left of train is tractor dump wagon.

were started with portable machines. All the drilling was done with Ingersoll-Rand R-24 jackhammer drills. The contractor had twelve of these drills on the job.

Driving Heading—The heading crew drilled a round of 21 or 22 holes, making a V cut, and used four delays to shoot the face. Drill steel, 10 ft. long, pulled 8 ft. at a round. Broken rock was loaded into low 1-yd. mine cars, of special construction, which were hauled by mules to the portal, where the cars dumped from a tipple into 4-yd. Kilbourne & Jacobs side-dump cars. Two Vulcan 12-ton saddle-tank steam dinkeys handled seven-car trains of the 4-yd. cars to the dump.

TUNNEL APPROACH CUT *(right)*, 65 ft. deep is opened with steam shovel and cars.



SPECIAL MINE CAR, with rotating body, is intended for use in heading rather than with steam dinkey on outside work.

Excavating Bench — Bench operations were planned to keep the mucking shovel busy at all times. The bench was shot in to 8-ft. lifts, only vertical holes being drilled, to allow drillers and shovel to operate at the same time. Two transverse rows of holes were drilled in each lift, the first row 4 ft. from the face and the second row 8 ft. from the face.

D. R. POMMERING *(left)*, **resident engineer, Virginian Railway Co.; BALLARD W. LOWE, superintendent, Sutton Co., Inc., and T. J. BROCKMAN, superintendent, Boxley Brothers Co., Inc.**

Sutton Co., Inc., Grading Section—The 4 miles of grading performed by the Sutton Co., Inc., under the direction of W. P. Sutton, president, and Ballard W. Lowe, superintendent, was practically all side-hill cut and fill work. Excavation averaged about 50,000 yd. per mile, of which 40 to 50 per cent was solid rock. About 30 per cent of the excavation could be cast; the rest was hauled an average distance of 800 to 900 ft. Side-hill cuts were of moderate height, ranging up to 40 ft. to top of slope.

In addition to side-hill work, the Sutton Co., Inc., had the west approach cut of the first tunnel, both approach cuts of the second tunnel, and the east approach cut of the most westerly tunnel. The cut at the west portal of the first tunnel was 60 to 65 ft. high and contained about 25,000 yd. of material. Hauls from this cut ranged up to 1,600 ft. in length.

The contractor handled the excavation with two Marion steam shovels of 1½-yd. and 1¼-yd. capacity. Hauling was done either with narrow-gage railway equipment or with tractor dump wagons. For short hauls on fairly stable ground, the contractor used four Winsor 4-yd. tractor dump wagons with great success. On the long hauls, and on short hauls in wet weather, two 8-ton Plymouth gasoline dinkeys pulling 5-yd. Koppel side-dump cars proved more serviceable.

The 5-yd. side-dump cars had bottoms lined with steel plate, an improvement made by the contractor at a cost of $26 a car. These steel-lined bottoms dumped clean, saving much time when wet or sticky material was being hauled.

Three Domestic pumps supply water for the shovels and for other purposes.

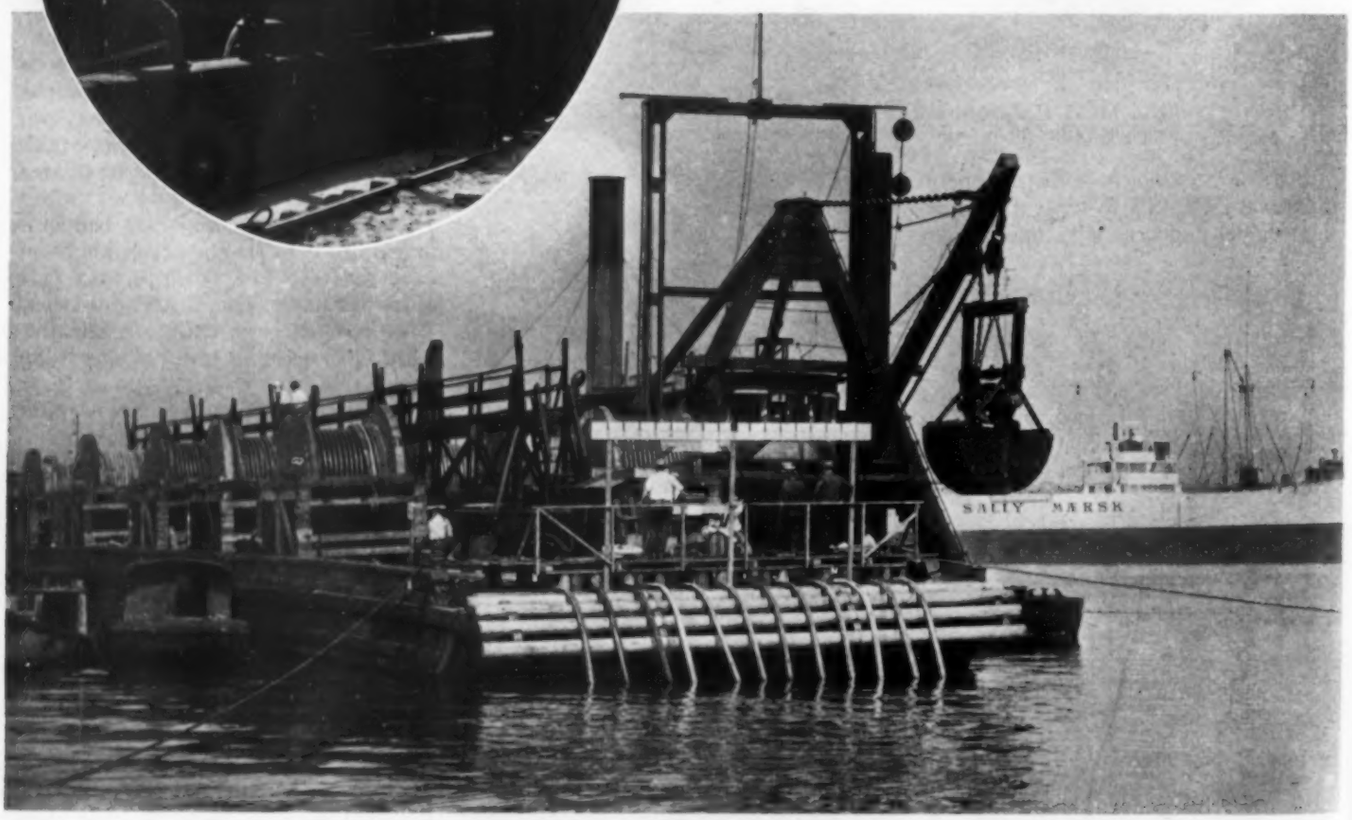
F. C. Sammons Co. Grading Section—The 3 miles at the west end of the project, graded by the F. C. Sammons Co., had approximately the same quantity of excavation and average length of haul as the Sutton Co.'s section. A Lorain 1¼-yd. gasoline shovel excavated the earth and broken rock. F. C. Sammons directed operations.

Engineering Supervision — A. M. Traugott, chief engineer, Norfolk, Va., was in general charge for the Virginian Railway Co. Directing operations in the field were A. Dole, division engineer, Mullens, W. Va., and D. R. Pommering, resident engineer.

Submarine Cables Laid
TWELVE AT A TIME

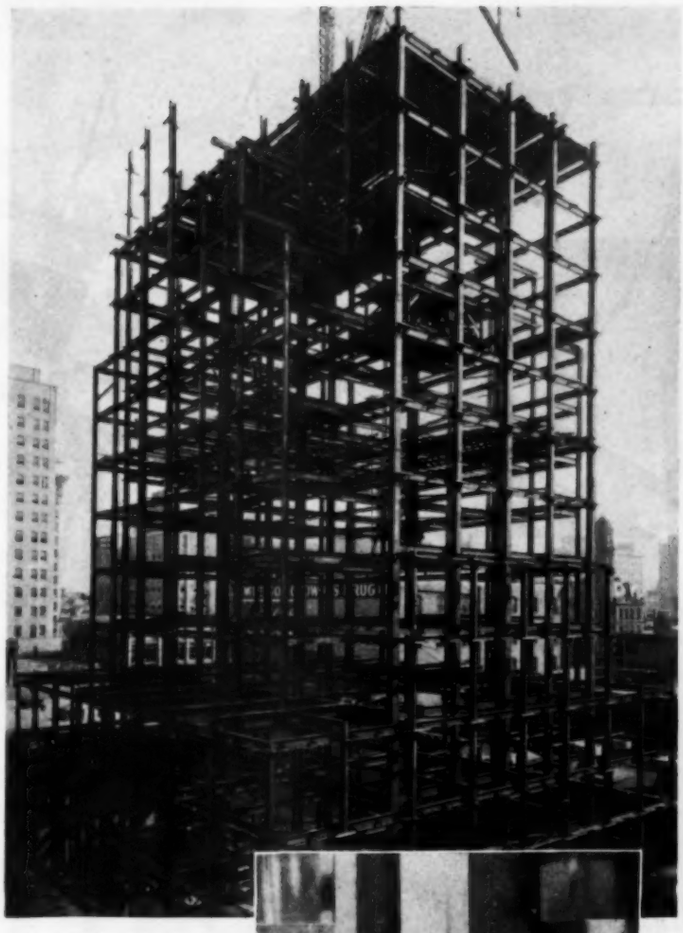
THE simultaneous laying of twelve submarine cables across the northwest channel of the Patapsco River has been accomplished by the Consolidated Gas, Electric Light & Power Co., of Baltimore, Md., using a car float equipped to pay off line from a dozen cable reels and fitted with sighting boards to maintain a check, by instruments on shore, of the alignment of the floating equipment during its passage across the stream.

Preliminary operations involved the dredging of 100,000 cu.yd. of material to form a trench 30 ft. wide and extending to a depth of 47 ft. across the existing 35-ft. channel. The length of the submarine cable crossing is 2,100 ft. On the car float were mounted twelve reels of 35-kv. General Electric cable, each weighing 32 tons, arranged to space the individual lines 2 ft. apart. The special construction for paying off the cable at the stern of the car float is illustrated in the picture below, which also shows one of the sighting boards. The dredge which excavated the trench for the crossing was also used to tow the car float across the river. After the cables had been laid the trench was backfilled to a depth of from 5 to 7 ft., involving the placing of about 25,000 cu.yd. of material.

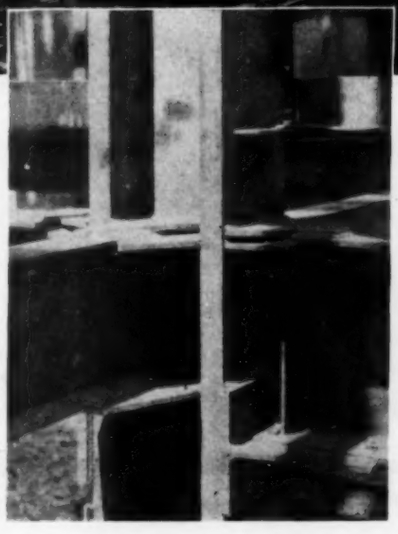


CABLE-LAYING CAR FLOAT was equipped to pay off line from twelve reels at one time. Note sighting board for check of alignment by instruments on shore. CABLE REELS *(in oval)* each weighed 32 tons and were handled by locomotive crane.

19-Story Building ELECTRICALLY WELDED



OFFICE BUILDING of Dallas (Tex.) Power & Light Co., with height 19 stories, is tallest all-welded structure.



BEAM - TO - COLUMN CONNECTION *(right)* involving wind-bracing, is made by electric welding.

PRACTICALLY all connections, both shop and field, for the 19-story steel-frame office building of the Dallas (Tex.) Power & Light Co. have been made by electric welding. Extending 246 ft. above its foundations, this structure ranks as the tallest all-welded building yet completed.

The ground floor plan is 100x100 ft. with several setbacks occurring at upper levels. Panels vary in size, averaging 25 ft. square. The steelwork consists of rolled columns, a few with cover plates, three plate girders, nine roof trusses and beams. Column lengths are two stories except for a top lift of three stories.

Welded connections were designed to eliminate all overhead welding in the field and to permit as much welding as possible to be done in the shop. Floor beams rest on webs of flame-cut I-beam brackets welded to the flanges of the columns, and on angle brackets welded to the column webs. Floor beams, designed to take wind stresses, are connected by two plates, one, on the under side of the top flange, being shop-welded and the other, on the top side of the beam, being field-welded.

Columns are spliced by plates welded to the outside of the flanges. The splice plates were shop-welded to the top of the columns, the upper half of the plate being drilled with four bolt holes for erection purposes. Enough holes were provided in all members for temporary bolted connections so that the erectors could work ahead independent of the welders.

Welding rods, $\frac{5}{32}$ and $\frac{5}{16}$ in. in diameter, were used to make $\frac{3}{8}$- and $\frac{1}{2}$-in. beads. Five Lincoln welding machines rated at 200 amp. were used.

The steelwork was fabricated and erected by the Mosher Steel & Machinery Co., of Dallas, Tex., from designs by R. L. Rolfe, of Gardner & Howe.

TYPICAL DETAILS of electrically welded connections on steel framework of Dallas Power & Light Co.'s office building.

M

BETTER

The above illustrates "Metro" Filter Flooring ready for the stone at Woodlawn, N. Y.

The George C. Diehl Company of Buffalo
Consulting Engineers

THE METROPOLITAN PAVING BRICK CO. CANTON, OHIO

Face Brick

Paving Brick

Structural Tile

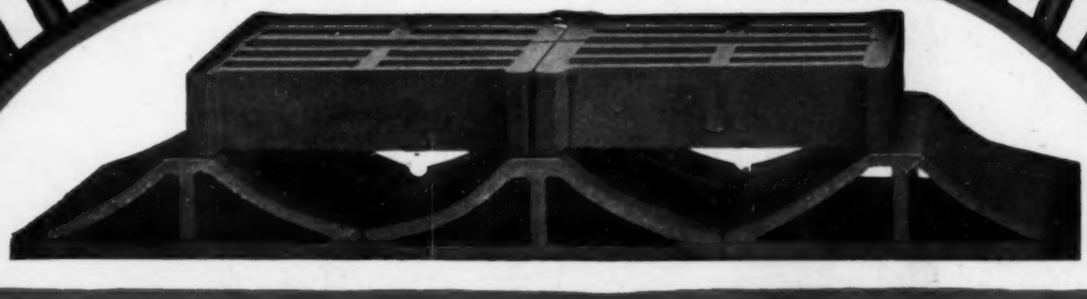
FOR EVERYONE CONCERNED

"METRO" FILTER FLOOR

From a purely engineering slant "Metro" is an ideal filter flooring because it is so designed as to give full filtering capacity—the area of the grill openings is equal to that of the voids in filtering media. There are no dead areas between drains to fill up with fine sludge and channels are easy of access for inspection and flushing.

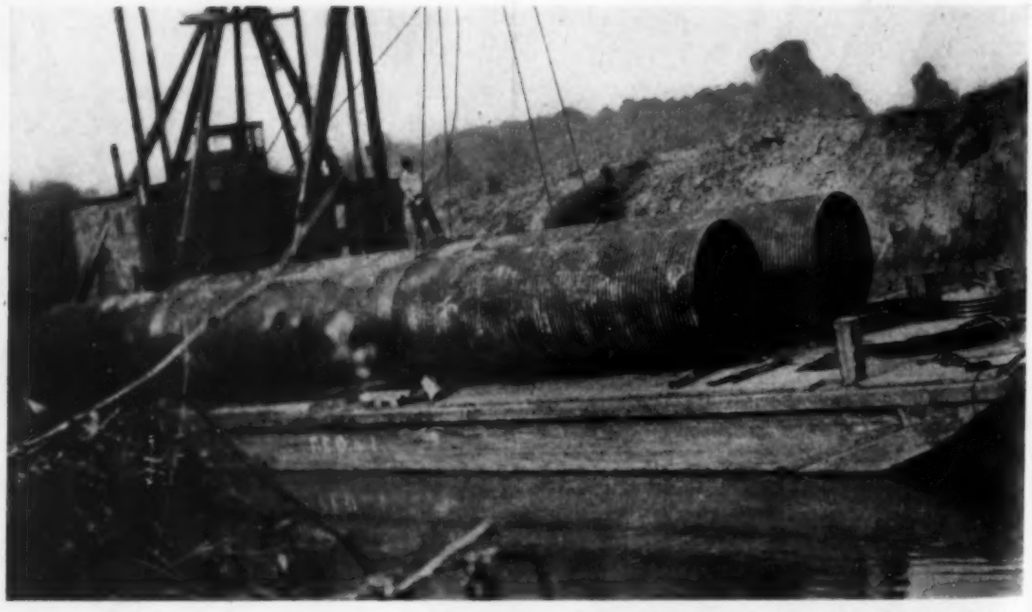
Then it is easy for the contractor to handle—being in two pieces men can lift it without trouble—it is not necessary to shape floor as "Metro" channel tile covers entire floor. This ease of construction appeals to the contractor.

The community also benefits from a "Metro" installation because this patented flooring does not require constant attention and maintenance. The first cost is practically the last—so "Metro" the original vitrified Filter Floor is better for all concerned—the Sanitary Engineer—the Contractor—the Public.



1 DRAINAGE DITCH in Fat Elk Creek District before starting installation of automatic drainage outlet control.

2 BULKHEAD and guide piling were placed with a floating piledriver.



3 THREE SECTIONS *(right)* of 72-in. corrugated iron pipe were joined into a 50-ft. length by means of a field-riveted connecting band. Air drills and hammers were used for this work.

Step-by-Step

Installing Outlet

MATERIALS suited to unstable soil conditions, special construction methods and economy featured the installation of drainage outlet control for the Fat Elk Creek Drainage District in Coos County. Ore. A battery of six Calco automatic drainage gates attached to 50-ft. lengths of Armco corrugated iron

4 FLOATED TO PLACE *(left)*. The pipe, with the seat for an automatic drainage gate attached, was lowered into the water to a depth sufficient to allow a 48-in. spruce log, 65 ft. in length, to be floated into the pipe. The pipe was then lowered until its total weight of 11,000 lb. was supported by the log.

5 AT HIGH TIDE *(below)* one man towed the pipe into place between the guide piling where it was anchored. Low tide lowered the pipe to the bed that had been prepared for it and freed the logs.

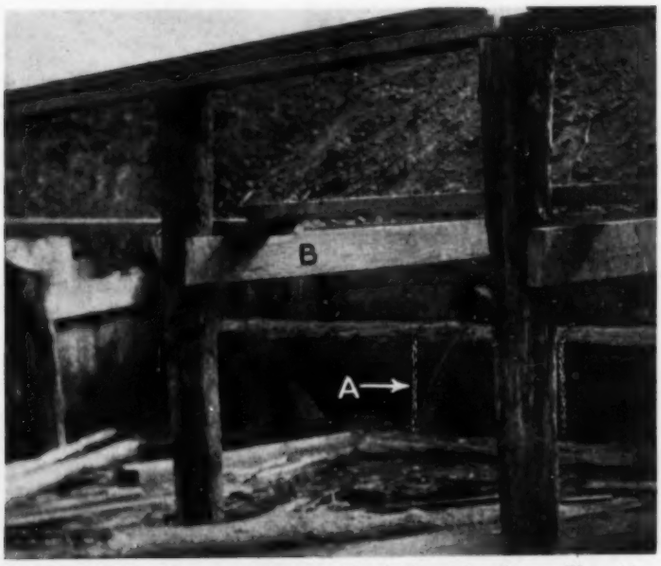
Field Methods

Drainage Control

pipe were quickly installed to provide additional outlet capacity and prevent backflow.

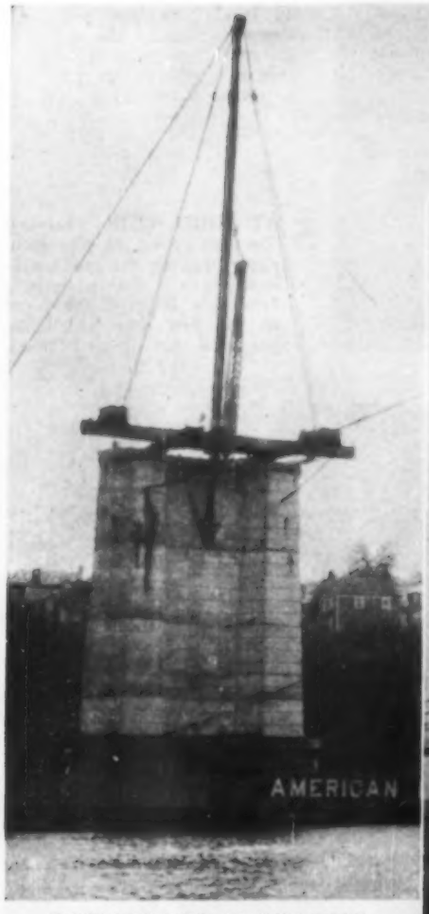
The method employed involved the use of a 65-ft. long spruce log inside the pipe to float it to place during high tide. Low tide lowered the pipe section to a prepared bed and freed the big floating log.

6 BUILDING A TIMBER BULKHEAD and constructing an earthen dike to a height 20 ft. above the center line of the pipe completed the job.

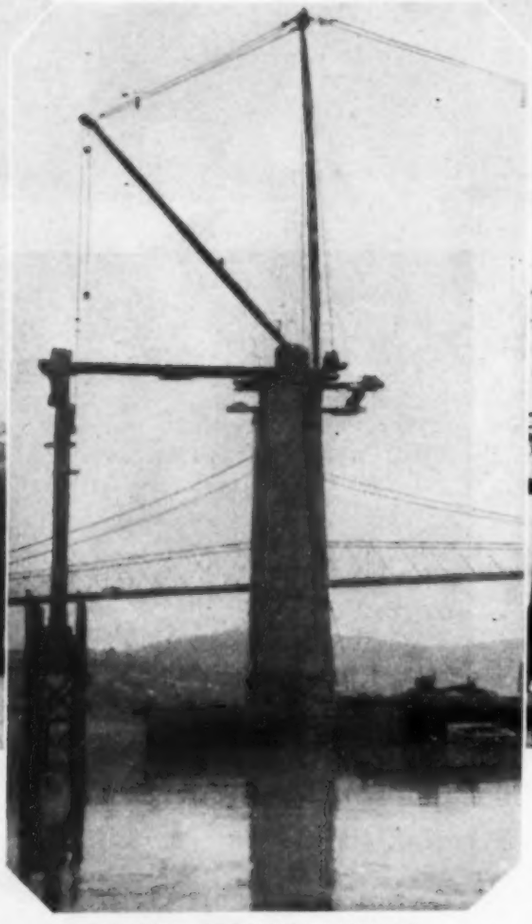


7 LIFT CHAINS, attached to small winches placed on piling 12 ft. out from the gate, provide a means of permitting inflow in dry weather. A—Gate lift chain. B—Temporary staging. C—Winch cap for chain lift.

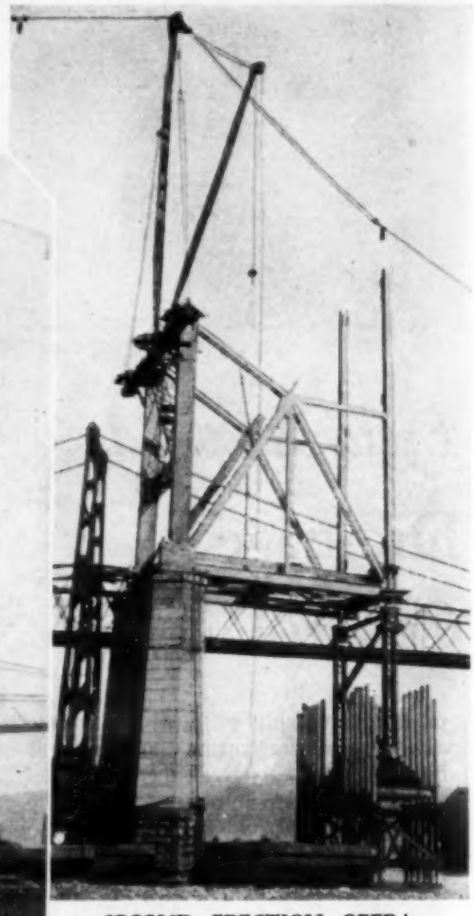
Guy Derricks Simplify Erection of CANTILEVER BRIDGE



BOOM SERVES AS GIN POLE to raise top section of mast, first step in assembling mast. Note how foot of boom is hung on two fall blocks and how top is guyed to pier beams.



FIRST ERECTION OPERATION. Derrick places bridge shoes on pier and erects steel to falsework bent.



SECOND ERECTION OPERATION. After being raised almost to top of bottom sections of tower columns, derrick fills out top of tower and two panels to falsework bent and then erects two cantilever panels on other side of pier.

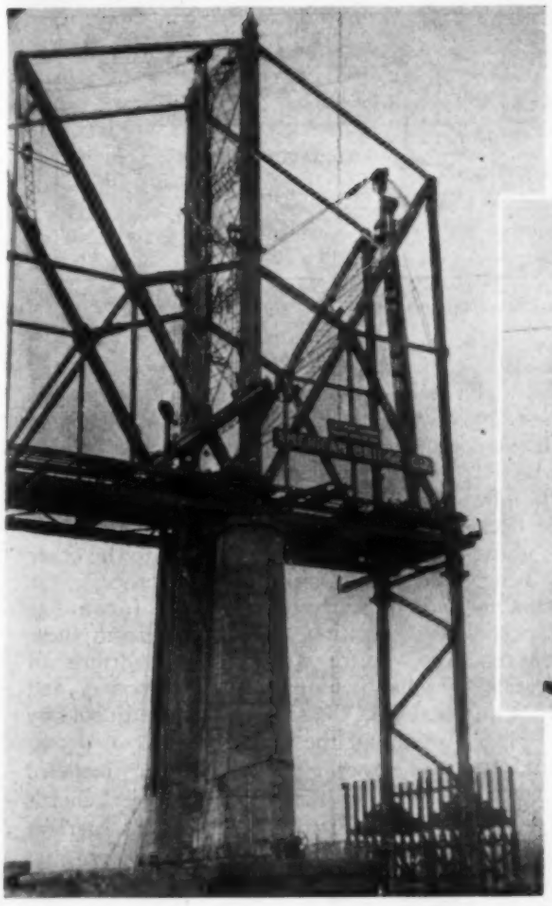
IN ERECTING the Rochester-Monaca cantilever bridge across the Ohio River, the American Bridge Co. employed a method which greatly simplified construction. Guy derricks set all the steel in the four spans of the structure. These derricks were so light, in comparison with older forms of travelers, that they required little reinforcing of the cantilever arms to erect steel to the center of the suspended spans.

The Rochester-Monaca bridge is the second to which this method has been applied. Initial trial of the guy derrick method was made on the Ohio River bridge at Louisville, Ky., erected in 1927-28.

As the diagram of the structure shows, the bridge has a main span of 780 ft., an anchor span of 480 ft., and end spans of 540 and 360 ft. Suspended spans 300 ft. long are included in the main span and in the 540-ft. end span. Beaver County, Pa., built the bridge to replace an old suspension structure which is too light to carry modern street railway and vehicular traffic between the cities of Rochester and Monaca.

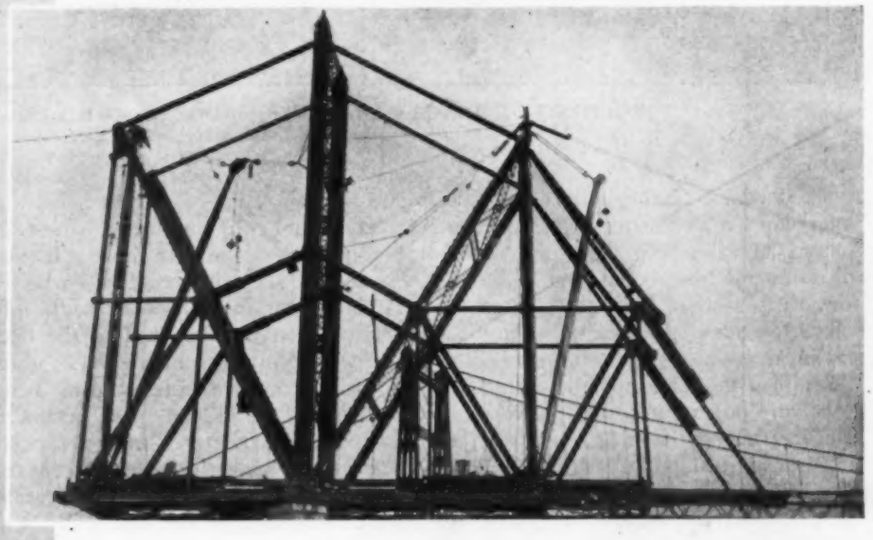
General Erection Scheme — With guy derricks, it is easy to start erection from a river pier, the fabricated material being shipped from the plant to the site by barges. On the Rochester-Monaca bridge, the contractor utilized this facility by beginning at Pier 2. After one derrick had erected the tower on this pier and had assembled a second derrick, the two derricks worked away from the pier. One derrick continued erection to the Rochester abutment. The second derrick, after completing half the main span, was dismantled and moved to Pier 1, where a third derrick already had erected the tower. These two derricks then erected the 360-ft. end span and the second half of the main span. Bents were placed, as shown by the diagram, at points required by this scheme of erection.

In placing the guy derrick on a pier and in raising it to erect the upper part of the tower, practically the same



AFTER ERECTING SECOND DERRICK *(left)* on wheeled carriage over falsework bent, derrick is lowered from raised position to deck, where it is jumped from mast beams to its carriage.

TWO DERRICKS *(below)* work away from pier. Note longitudinal guys, from spider at top of mast, becketed to tower.



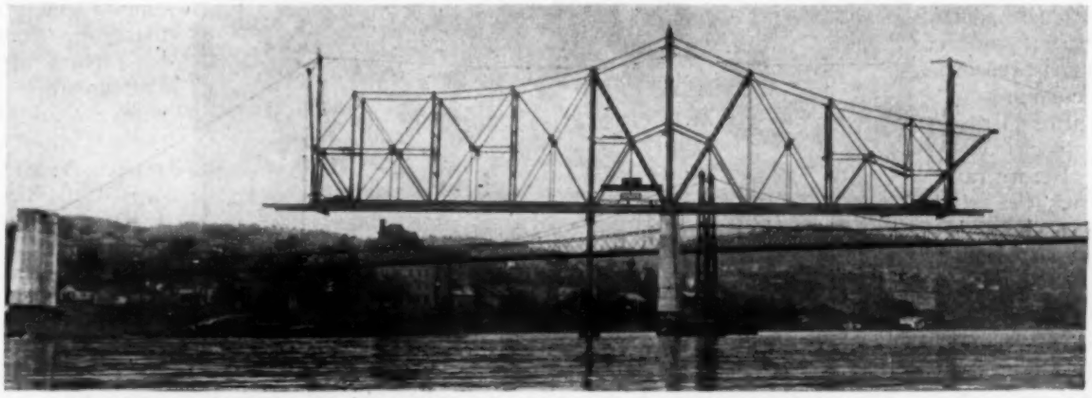
method was employed as in jumping the derricks on steel buildings. The boom was raised first and was used as a gin pole to lift the mast. Special beams on the pier top supported the derrick in its first position. In its raised position on the tower, column brackets carried the beams which supported the derrick. The beams in both cases afforded means of shackling side guys at a reasonable distance from the foot of the mast.

Longitudinal guys ran from the top of the mast to piers, towers, or dead men, depending upon the location of the derrick and the stage of construction. The longitudinal guys were of a special continuous-rope construction which allowed easy longitudinal movement of the derrick. More will be said of these guys later.

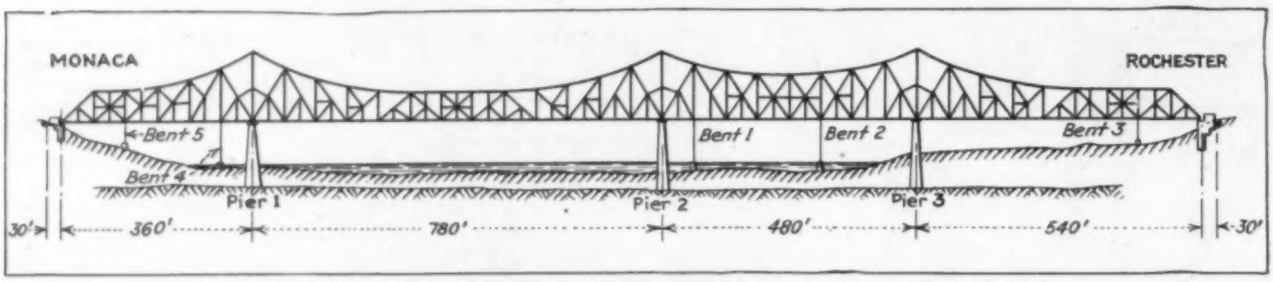
For movement over the structure, the derrick was seated on a wheeled carriage which ran on rails. Side guys were attached to the ends of a long beam hung crosswise beneath the bridge trusses. When lifting, the derrick always was over a floor beam, and the weight of the rig was transferred by means of shims from the carriage to the floor beam.

Erecting Derrick on Pier — The three derricks had 108-ft. masts and 95-ft. booms. Each derrick with its carriage weighed 50 tons. Before starting erection at a pier, a steel falsework bent was placed two panel lengths (60 ft.) from the pier. Six 15-in. I-beams of three lengths, the longest being 40 ft., were placed longitudinally across the pier in two groups of three, one group on each side of the pier. These beams were known as the pier beams. Four bolts anchored each group to the pier. Two beams, called the boom beams, were placed laterally in front of the pier across the two sets of pier beams to assist in the assembling and raising of the boom.

The erectors assembled the boom in upright position through the boom beams, working from barges. Lines used in assembling and raising the boom were reeved through pulley blocks attached to these beams. Guy lines were connected from the top of the boom to the extremeties of the longest pier beams to steady the boom while it was acting as a gin pole in raising the mast. To serve as a gin pole, the boom was raised by two sets of blocks and falls until it extended about 75 ft. above the boom beams. The foot of the boom then hung on the two fall blocks about 20 ft. below the boom beams.



DERRICKS CONTINUE ERECTION on both sides of pier. Derrick at left will continue to abutment; derrick at right will erect steel to center of main span.



ROCHESTER-MONACA CANTILEVER BRIDGE has 480-ft. anchor span and 780-ft. main span. Derricks start erection at Pier 2.

Two 30-in. Carnegie beams 64 ft. long, known as the mast beams, were placed laterally across the pier beams, in front of the boom beams and a few feet farther than they from the pier, to carry the mast. Using the boom as a gin pole, the erection crew assembled the mast upright against the pier, and hoisted it to the mast beams. Before raising the mast, the crew put on the longitudinal guys and played out the falls to provide sufficient slack for placing the mast in position. With the mast in position, the erectors reeved the topping lift of the boom, pulled the boom into place, and put in the boom pin.

First Erection Operation — The derrick, in this position, placed the bridge shoes on the pier and the bottom chords to the falsework bent. After erecting diagonal members on the two chord members to brace the bottom sections of the tower columns, it set these sections of the columns. To erect the upper portion of the tower and adjacent panels, the derrick had to be raised almost to the top of the bottom sections of the tower columns. Brackets were placed on the columns to carry the mast beams in raised position, and stub columns were erected on top of the permanent column sections to aid in raising the mast beams. The stub columns had cantilever arms from which fall blocks were suspended. Before raising the derrick, the erectors slacked off the longitudinal guys and lashed the mast to the foot block.

Second Erection Operation — In its raised position, the derrick filled out the top of the tower and the two panels already started and erected the two cantilever panels on the other side of the pier. It also erected the second derrick on a wheeled carriage over the falsework bent. The derrick then was lowered to the deck and was jumped from the mast beams to its carriage, the side guys being transferred from the mast beams to the 64-ft. Carnegie 30-in. guy anchor beam slung beneath the bottom chords. Longitudinal guys of both derricks were becketed to the tower by wire rope slings.

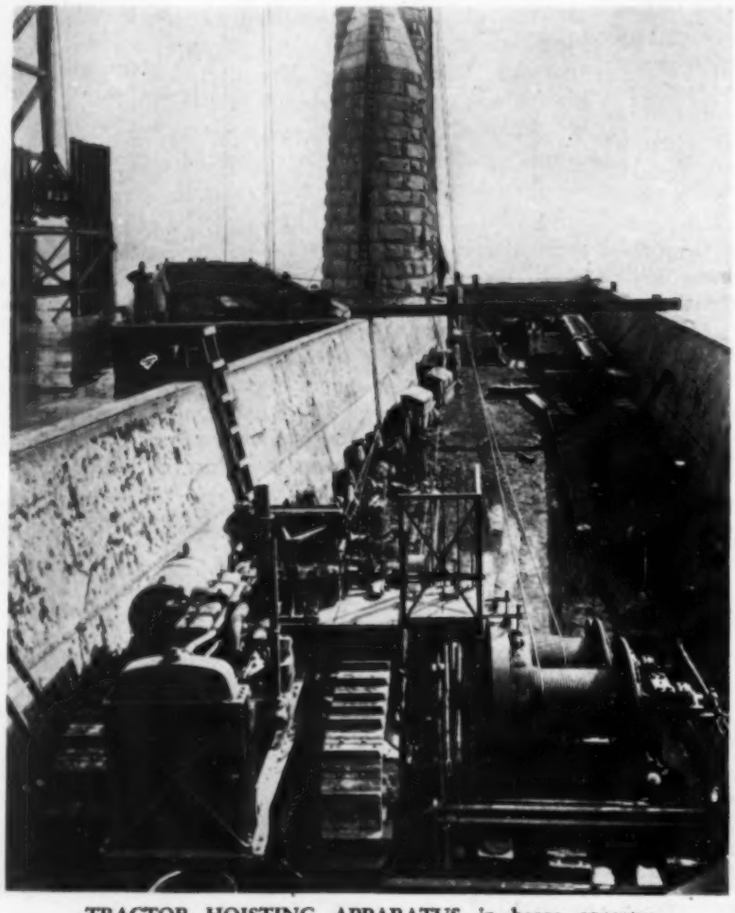
The carriage was mounted on four double-flanged wheels. These wheels ran on 85-lb. rails clipped and bolted to stringers designed for the street railway track.

Moving Derrick—To move the carriage forward, the derrick boom was swung to one side and was hitched to the deck. Workmen unhitched the guy on that side from the guy anchor beam, moved the side guy forward, and hitched it to the forward floor beam. The boom then was swung to the other side, and, by the same process, the second side guy was carried forward to new position. Lead lines from these guys were wound on the drums of crabs mounted on the carriage, and stress in the side guys was adjusted by means of the crabs.

Temporary side guys were installed from the mast to the lower chords of the trusses. As the carriage moved forward, the temporary guys were slacked off and the permanent guys were shortened. Before starting forward, the derrick swung the guy anchor beam ahead to its new position, where the beam was fastened temporarily.

A hold-back line was used in moving to keep the top of the mast from advancing more rapidly than the carriage. This line was becketed to the tower and was reeved through a snatch block at the top of the mast to a crab on the carriage.

Longitudinal Guys—A continuous rope, reeved at each end through a sheave block, formed the longitudinal guys. The mast was connected to both parts of the continuous rope by guide sheaves and by stub ropes clamped to the guy rope. A spider at the top of the mast carried eight sheaves, four for each part of the guy rope. Two of the four sheaves carried one part of the rope; the other two ran on it. Each part of the continuous rope was clamped to two stub ropes attached to the spider.



TRACTOR HOISTING APPARATUS in barge operates derrick on deck of bridge.

When moving the derrick forward, it was necessary to unclamp only one pair of stub ropes from one part of the continuous guy, leaving the spider connected to the second part. This second part of the continuous rope, moving forward with the derrick, helped to control longitudinal movement of the mast.

When the derrick had been moved to final position over a floor beam, a screw jack on the carriage lifted the derrick, permitting workmen to place shims which transferred the load to the floor beam. Brackets on the floor beam provided support for the rails several feet beyond the beam and allowed the carriage to be run forward far enough to center the derrick over the beam.

Tractor Hoisting Apparatus—Main hoisting falls, auxiliary hoisting falls, runner line, topping lift, and swinging lines of each derrick were operated from a tractor-powered hoist engine mounted in a barge at the pier. The power unit of the engine was a Caterpillar 60-hp. tractor which itself carried two main drums capable of holding 1,500 ft. of ¾-in. wire rope. This attachment gave a lead line pull of 26,000 lb. at low speed, 110 ft. a minute, and a pull of 16,000 lb. at high speed, 150 ft. a minute. The tractor hoist was placed on a steel bed. On the bed in front of the tractor hoist was a double-drum hoist with two smaller drums for boom swinging.

The six drums mentioned constituted the full equipment of one of the two tractor-hoist outfits mounted in the barge at the Rochester-Monaca bridge. An additional double-drum hoist was connected at the side of the second tractor hoist. This double-drum hoist operated a material car between the two derricks.

One of the two derricks unloaded all steel from barges. This practice was followed by necessity at times when a barge could not get under the second derrick and by choice at other times when the contractor wished to keep barges out of the main channel used for navigation.

The hoists of the tractor-powered hoisting apparatus were chain-driven from the tractor engine and were operated by one man on the lever platform. A great advantage of this apparatus is that the tractor hoisting engine can be disconnected from the bed and from the other hoists in a few minutes to perform miscellaneous hoisting service around the job until needed again to operate the main hoist.

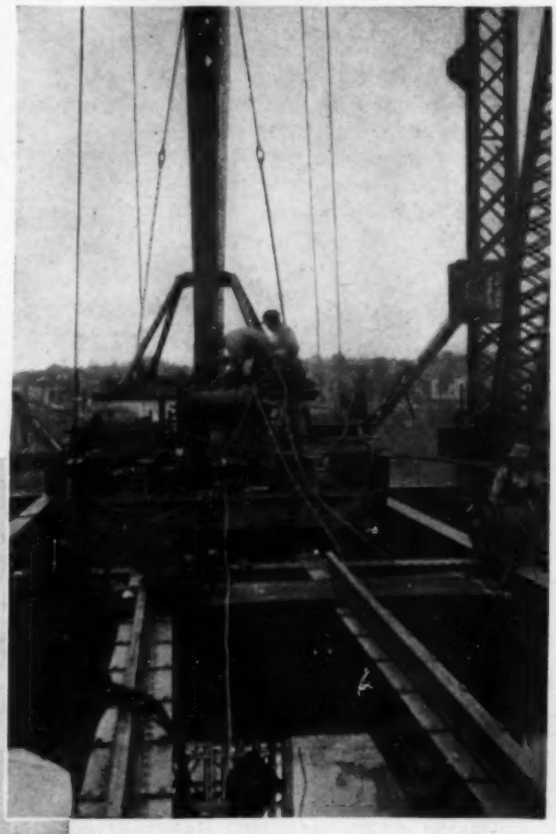
To operate the third derrick, working alone, the contractor used a four-drum steam hoist. A second four-drum steam hoist operated the material derrick and the car which supplied steel to this derrick. Reamer motors were used to operate the hand winches which swung the booms of both these derricks.

The contractor started erection of the 4,974 tons of steel in the bridge in April, 1929, and completed the erection on Feb. 15, 1930.

Both the guy derrick method of erecting cantilever bridges and the tractor erecting and hoisting apparatus are covered by patent applications in the U. S. Patent Office.

Personnel—T. J. Wilkerson, county engineer of Beaver County, designed the bridge and supervised construction. The actual work of erection was under the direct charge of James L. deVou, central division erection manager, American Bridge Co., Pittsburgh, who developed the guy derrick scheme of erection and the tractor hoisting apparatus to operate the derricks. L. A. Paddock, vice-president in charge of operation, and Richard Khuen, Jr., general manager of erection, exercised general supervisory control of construction. At the bridge, the work of the American Bridge Co. was directed by G. B. Cumpston, foreman, and A. J. Anderson, field engineer.

WHEELED CARRIAGE *(right)* **on which derrick is mounted travels on steel rails. Crabs on carriage adjust stress in side guys.**



BRACKETS ON FLOOR BEAM *(below)* **permit carriage to be run forward, centering derrick over beam.**

Coming

The January (1931) issue of *Construction Methods* will be the annual

ROAD BUILDERS' NUMBER

appearing on the eve of the convention at St. Louis, Jan. 12-16, of the American Road Builders' Association.

Twelfth of a series of articles on the $325,000,000 construction program for flood control in the Mississippi Valley

The Defense Against OLD MAN RIVER-XII

By ROBERT K. TOMLIN
Editor of *Construction Methods*

Bank Grading and Paving

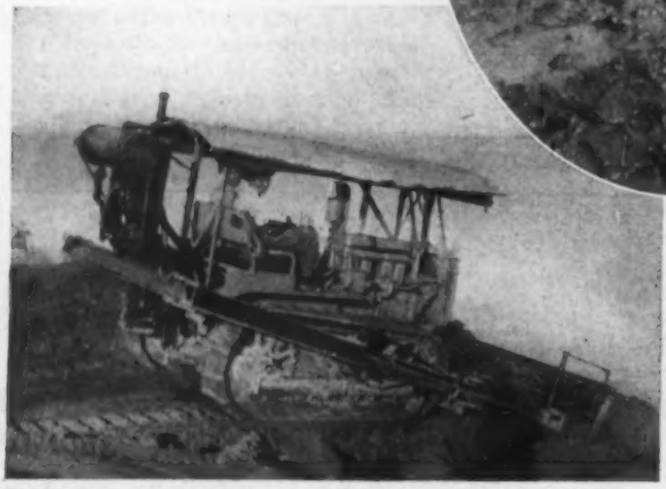
AFTER the placing of subaqueous revetment mats of willow or of concrete, as previously described in this series of articles (see *Construction Methods* for March, p. 48; July, p. 56; September, p. 58; and October, p. 58) the stabilization of the caving banks of the Mississippi River is completed by grading and paving with concrete the slopes above the water line. This upper-bank paving constitutes an extension of the protective covering furnished by the underwater revetment mats and provides against damage by

HYDRAULIC SLUICING is employed to grade the river banks prior to paving them with concrete.

HIGH PRESSURE STREAMS from monitors undercut the bank material and wash it into river.

BULLDOZER *(below)* on tractor brings rough slope *(in oval)* to uniform grade.

FRESNO SCRAPER *(below)*, hauled by cable from barge moored along river bank, smooths slope.



MECHANICAL BANK GRADER is special adaptation of 150-ft. boom dragline excavator mounted on railway track on two barges. A pair of dipper sticks on traveling cradle *(in oval)* carry curved scraper blade operated by dragline cable. This machine can grade upper bank and also underwater slopes to depth of 12 ft.

undercutting currents during high river stages.

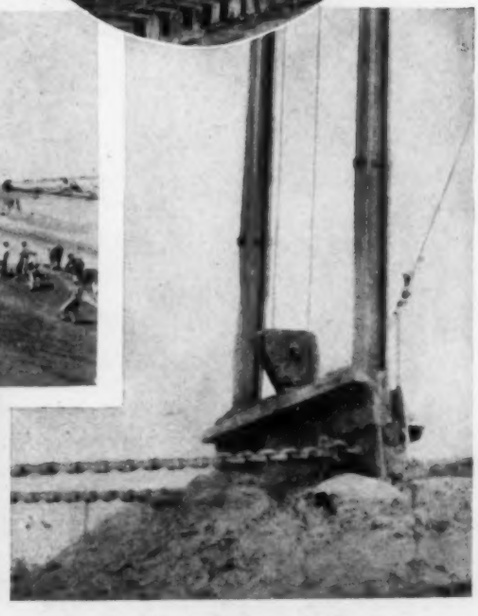
Preliminary to paving, the bank is first cleared of trees and underbrush for a distance of 100 ft. inshore from the upper edge of the proposed grading. Stumps are removed by explosives. Banks undercut by the river current frequently have sides that are almost perpendicular. They must be cut back above the water line to a uniform slope of about 1 on 4 to receive the concrete paving.

Grading—Bank grading is done by several different methods, including (1) leaning-wheel blade graders hauled by tractors, (2) power-operated fresno scrapers, (3) hydraulic sluicing, (4) special floating dragline with long boom and scraper blade.

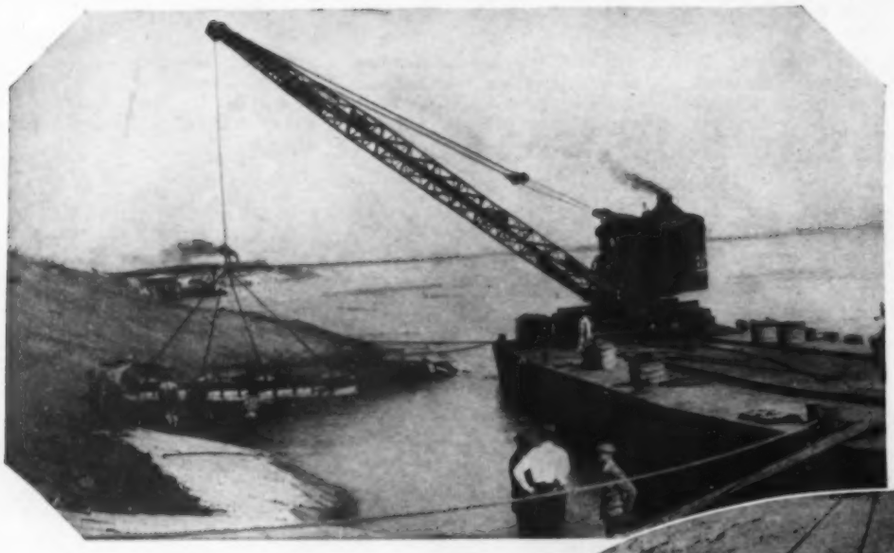
Blade grader operations, when the soil is heavy, are finished by hand shovel slope dressing. The fresno scrapers, as illustrated, are pulled riverward by a cable from a two-drum hoist on a barge; a backhaul cable brings the fresno up the bank for a new cut.

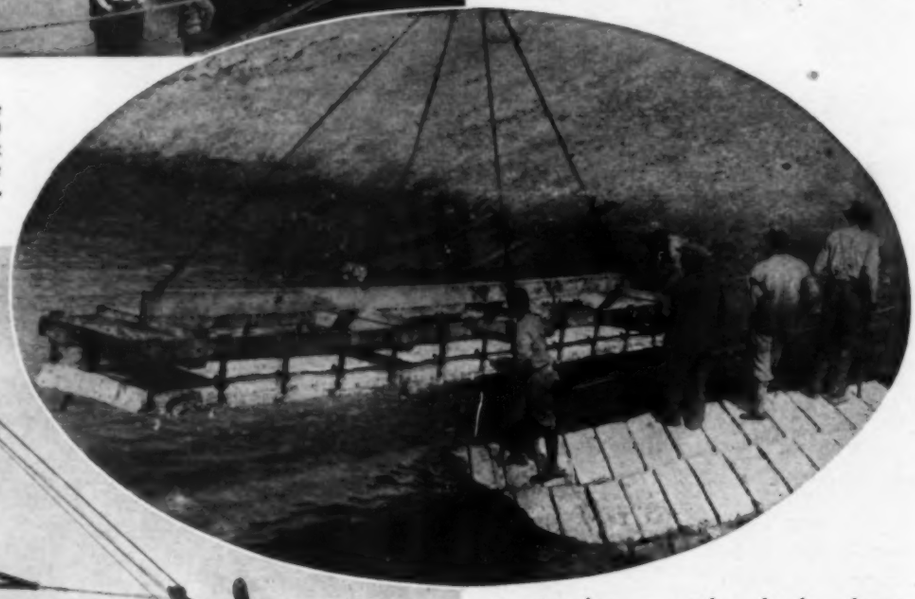
For hydraulic grading the plant unit consists of a barge carrying two turbine-driven multiple-stage

HAND FINISHING on upper banks is done to produce a uniform slope of 1 on 4. In the background is the concreting crew which places a 4-in. monolithic slab on the graded bank.

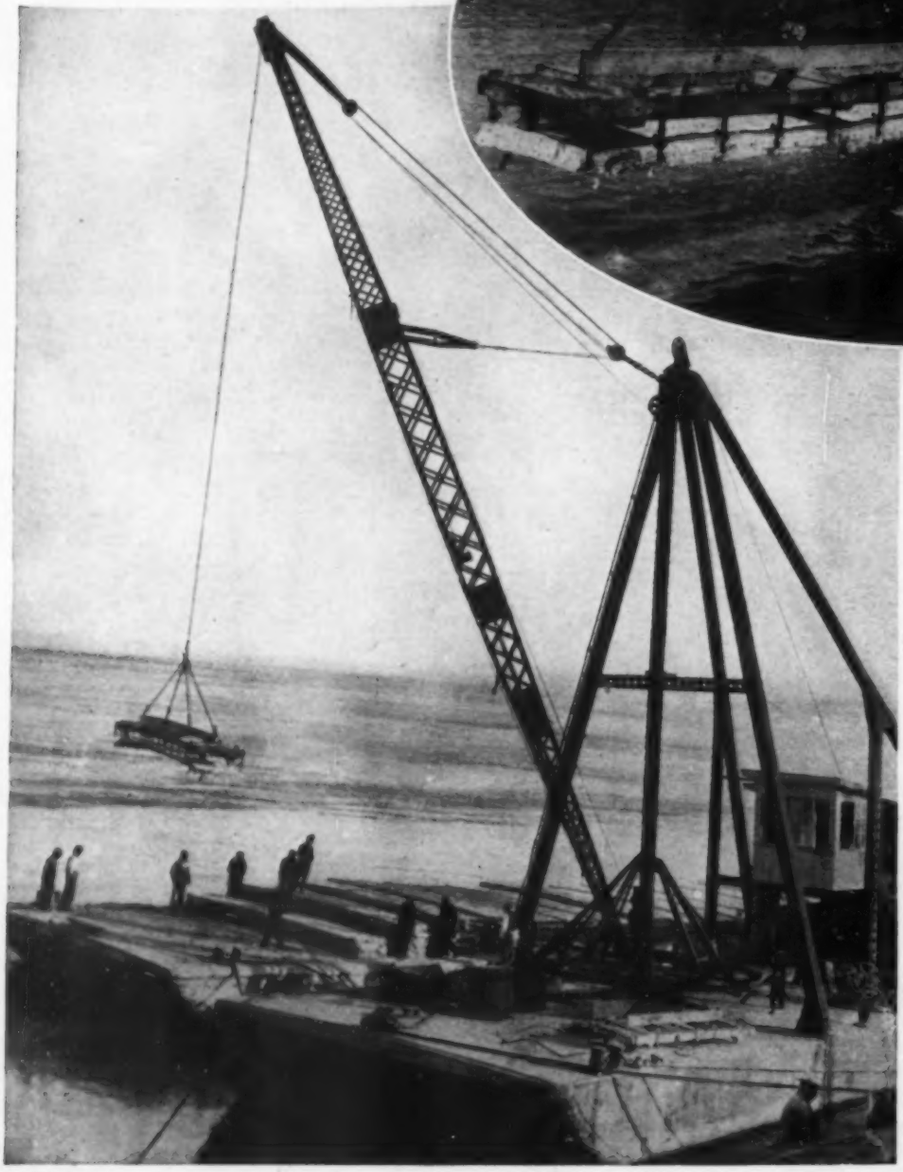


DETAIL of scraper blade on end of vertical dipper sticks of mechanical bank grader.





REVETMENT MAT UNITS of the articulated concrete slab type *(in oval)* are placed individually on the upper bank either by barge-mounted locomotive crane *(above)* or by derrick boat *(below)*.



centrifugal pumps, each delivering 750 gal. of river water per minute at 250 lb. per square inch pressure to a line of 5-in. pipe with Moran flexible ball-and-socket joints. From the pipe line on shore, lengths of 4-in. rubber hose carry the sluicing water from each pump to a 1¼-in. monitor nozzle. The method is to slope the bank by undercutting with the high-pressure streams from the nozzles, washing the material into the river. After the bank has thus been brought approximately to proper slope, the grading is finished by a La Plant-Choate bulldozer on a Caterpillar tractor of the hillside type having crawlers set wide apart to prevent overturning on the bank slopes.

In contrast with the hydraulic sluicing equipment a so-called mechanical bank grader, devised by the U. S. Engineer Department, is a unique adaptation of a full-revolving steam-operated Bucyrus dragline excavator. Track-mounted for a travel of 42 ft. on a pair of barges, the machine has a boom of long reach, 150 ft. On the boom are rigged a pair of 45-ft. vertical dipper sticks carrying a curved steel scraper blade. The dipper sticks may be raised or lowered in guides on a traveling cradle which runs in or out along the boom. The scraper head is operated by a dragline and a backhaul cable. This machine can carry the bank grades 12 ft. below the water surface, if desired, in addition to grading the upper reaches of the slope.

Upper Bank Paving—For paving graded banks above the edges of subaqueous revetment mats monolithic reinforced concrete, standard articulated concrete mat sections, placed individually, concrete blocks and riprap are used.

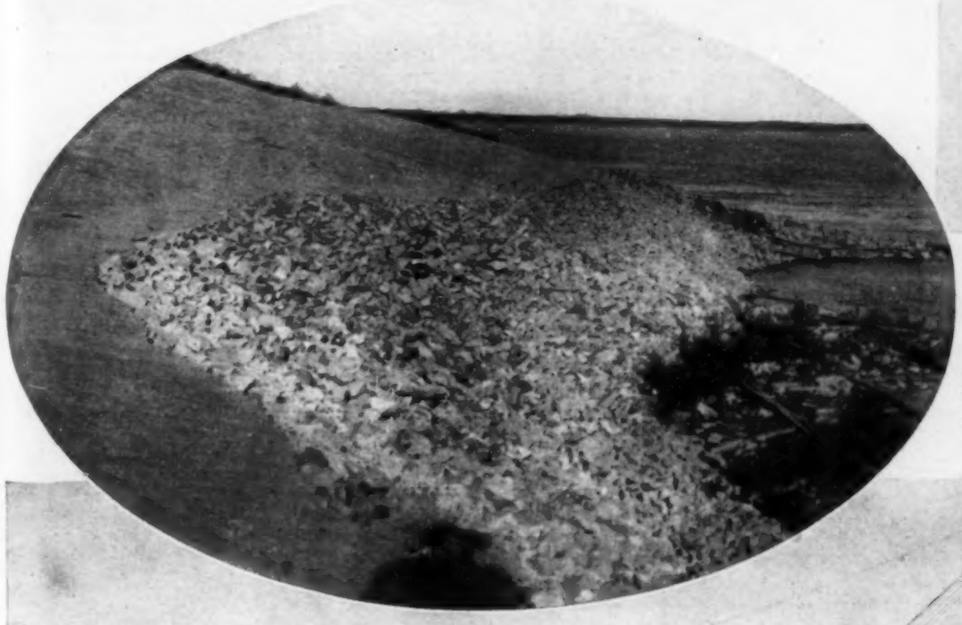
The monolithic paving is a concrete slab 4 in. thick, reinforced with steel

wire mesh imbedded at least ½ in. below the upper surface of the concrete. Along its upper edge is an anchoring curb cast in a trench 4 in. wide and 18 in. deep. The slab reinforcement is turned down into the trench for the anchoring curb and concrete for slab and curb poured simultaneously. The bank paving slabs are cast in strips 15 to 18 ft. wide. An expansion joint with 4-in. opening is placed every 200 ft.

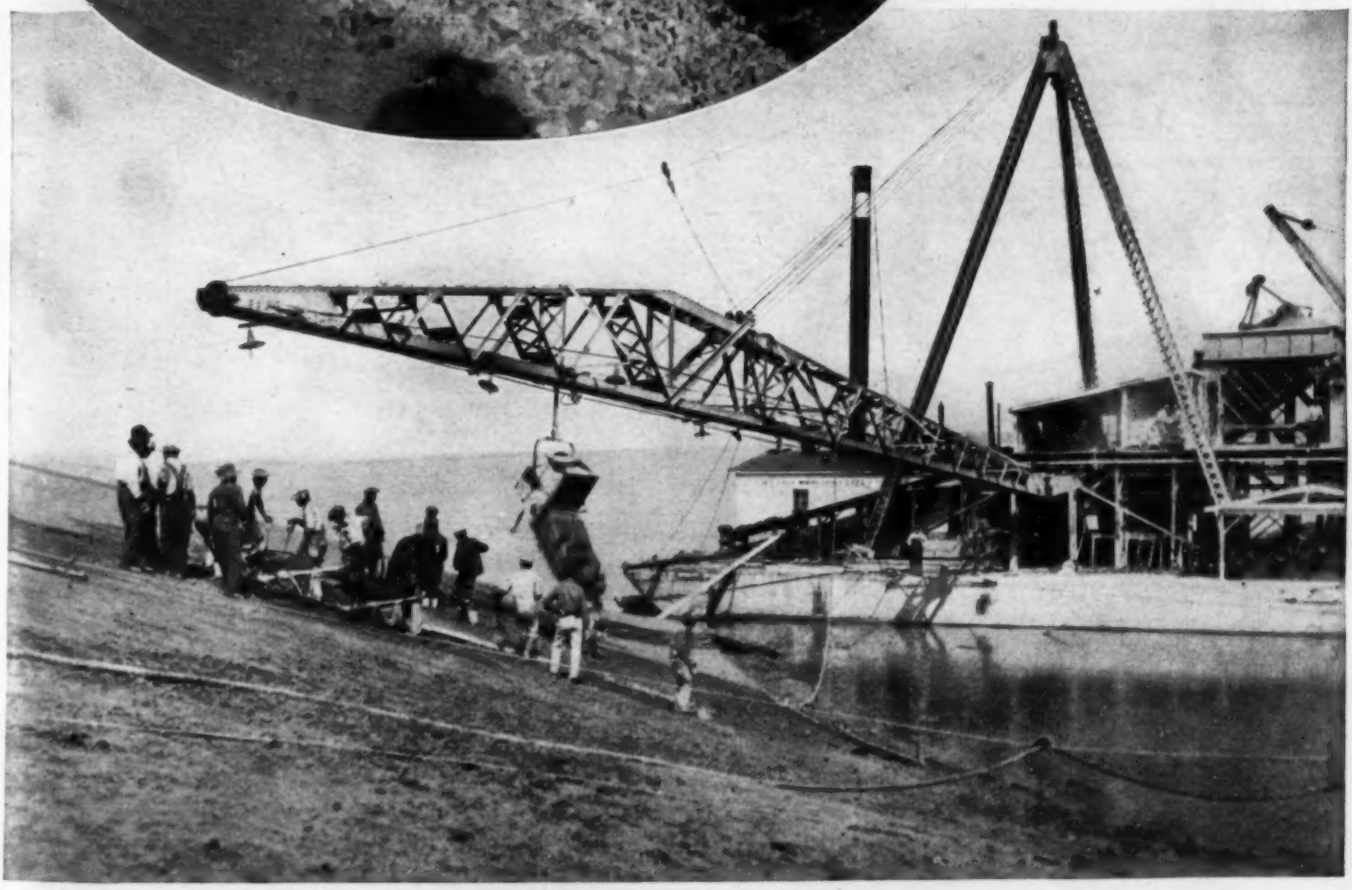
Concrete for the monolithic bank pavement is mixed at a floating plant, carrying a 1-yd. Smith mixer. The mixer discharges into a bottom-dump bucket which travels out over the river bank on a 125-ft. steel truss boom and empties its load directly to place on the graded slope. The concrete is screeded and then cured by wetting for 10 days. Anchor cables from the subaqueous mats are extended up the river bank and imbedded in the paving.

The upper bank is sometimes paved with articulated concrete mat units of the same design as is used for subaqueous mats. In this case the flexible sections, 25 ft. long, are picked up one at a time by a barge derrick or crane and placed on the bank, starting from the water's edge. The flexible mats are given an overlap of two blocks per section.

C. J. RHODES, engineer in charge of the northern area of the New Orleans river district of the U. S. Engineer Department.



RIPRAP *(left)* forms junction between subaqueous revetment mat and upper bank paving.



CONCRETING PLANT for upper-bank paving consists of mixer on barge and 125-ft. boom and bucket rig which extends out over the slope.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction

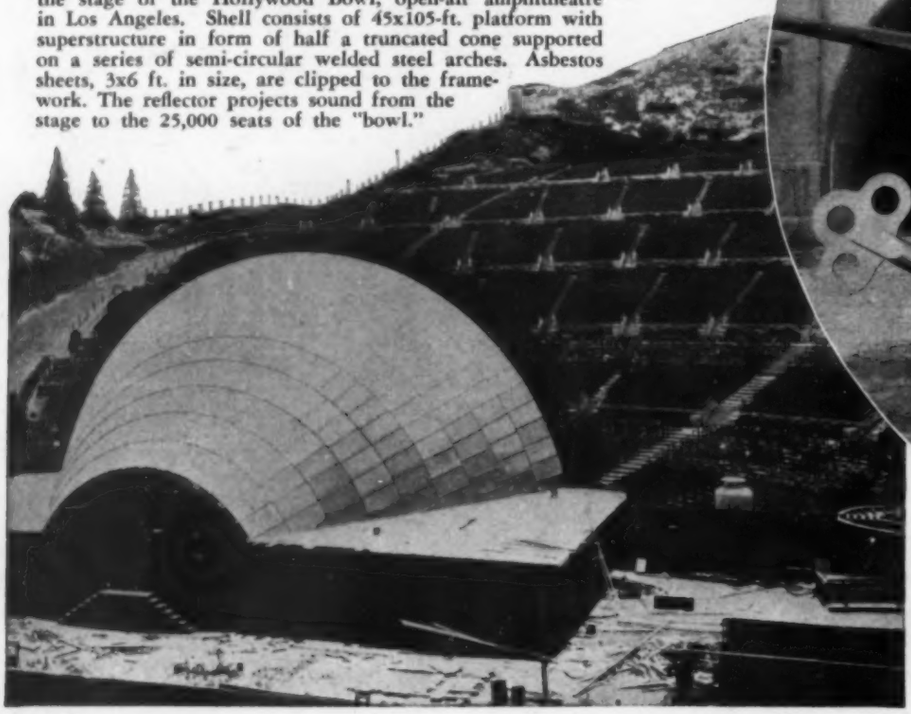
©International

WHERE THE CAMEL WALKS A MILE. Native road-building scene in India that gives a reverse twist to the slogan for a popular brand of cigarettes when supplies are needed by the construction crew.

ROUND CITY *(below)*. Buildings forming modern tenement group in Leipzig, Germany, are laid out in the form of concentric circles, with radial and circumferential streets.

©Wide World

LOUDER AND FUNNIER! *(below)*. Sound reflector or orchestra shell, mounted on wheels, has been installed on the stage of the Hollywood Bowl, open-air amphitheatre in Los Angeles. Shell consists of 45x105-ft. platform with superstructure in form of half a truncated cone supported on a series of semi-circular welded steel arches. Asbestos sheets, 3x6 ft. in size, are clipped to the framework. The reflector projects sound from the stage to the 25,000 seats of the "bowl."



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UNLOCKS NEW TUNNEL ROUTE *(above)*. With huge key Bernice Robinson performs ceremony of opening lock admitting vehicular traffic to newly completed Sepulveda tunnel at west Los Angeles, establishing a direct highway connection between San Fernando valley and the sea.

Present and Accounted For—

A Page of Personalities

DIABLO DAM BUILDERS *(right)*. Members of Winston Bros. Co., who directed work on recently completed 389-ft. high constant-angle arch structure of concrete on Skagit River near Seattle, Wash. *(Left to right)* W. O. Winston, Jr.; E. R. Clarke; W. H. Gardiner; F. T. Hillman; L. S. Oakes, and Matt S. Glavin.

HEADS SAFETY COUNCIL *(below)*. Carl W. Bergquist, superintendent of public relations for the Western Electric Co., at Chicago, was elected president of the National Safety Council at that organization's annual convention last month.

© Underwood & Underwood

ENGINEER CHIEF OF STAFF *(below, right)*. For the first time since the creation of the General Staff of the U. S. Army in 1903, that department is headed by an engineer, in the person of General Douglas MacArthur, infantry brigade commander in France during the World War and former superintendent of the U. S. Military Academy at West Point.

INSPECTION BY AIRPLANE *(left)*. Official party visiting Columbia Basin reclamation project includes: *(left to right)* R. F. Walter, chief engineer, Bureau of Reclamation; R. R. Gill, Columbia Basin League; Dr. Elwood Mead, Commissioner of Reclamation; A. J. Turner, consulting engineer; C. N. McClellan, chief electrical engineer, and N. B. Mamer, airplane pilot.

Photo U. S. Bureau of Reclamation

NEW EQUIPMENT ON THE JOB

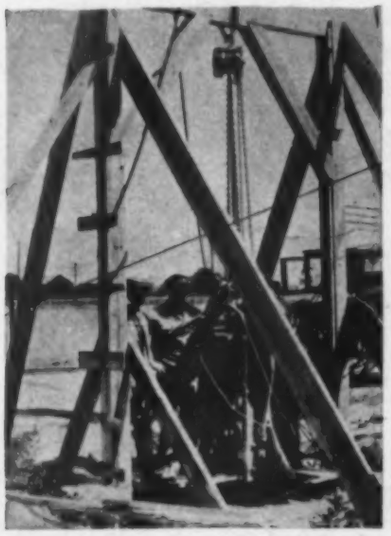
Air-Cooled Compressor

The application of the principle of air cooling instead of the usual practice of water cooling has been applied in the construction of the new air-compressors now being manufactured by the Davey Compressor Co., Inc., of

Kent, Ohio. Compressor heads and manifolds are of aluminum alloy cast with deep fins to give greater radiating area, thus keeping temperatures low. These compressors deliver 142 cu.ft. of air per minute and may be had in four mountings, two for tractors, one for trailers and one for skids.

Electrically-Driven Caisson Pump

For handling water at high heads from deep caissons, the Yeomans Brothers Co., of Chicago, has brought out an electrically-driven pump which will handle water containing sand, silt or mineral or acid solutions and can



be lowered by cable from crane or derrick as construction progresses.

This pump consists of a forged steel yoke with lifting ring and two 10½-lb. side channels between which motor and pump are supported and anchored. It is made of close-grained, cast-iron and direct-connected to a vertical motor through flexible coupling. The open-type impeller is mounted on a stainless steel shaft.

The pumps range in capacity from 50 to 200 gal. per minute with heads from 40 to 110 ft.

Torch for Construction Jobs

The T & B torch designed to withstand hard usage and to stay lighted in bad weather is offered to contractors by the Consolidated Iron-Steel Manu-

facturing Co., of Cleveland. These torches are cast of the best quality gray iron, the joints are accurately fitted, and they are shaped in such a way as to afford maximum stability without artificial ballast which would add to their weight and cost. They are practically unbreakable.

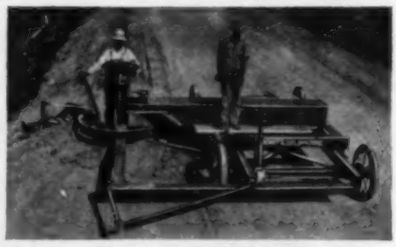
Self-Vulcanizing Compound of Plastic Rubber

Covulc rubber is announced by the Hitchcock Co., Boston, Mass., as a new self-vulcanizing plastic compound which may be applied without the use of heat, steam or pressure to form a tough, durable coating for resurfacing conveyor belts, covering pipes, lining chutes, hoppers and other equipment to be protected against abrasion and corrosion. The compound is produced in two forms: (1) a thick paste which vulcanizes when exposed to the air, remaining soft and flexible; (2) in sheets vulcanized to wire mesh base.

Shoulder Trimming Machine

Trimming shoulders with speed and economy can be accomplished by the new Moritz shoulder machine, according to its manufacturers, the Moritz-Bennett Corporation, of Effingham, Ill.

This machine is equipped with a



boom which can be adjusted to shoulders of any width up to 8 ft. and to accommodate three lengths of blades, namely, 7 ft. 6 in., 9 ft. and 10 ft. A fifth wheel arrangement enables the machine to be turned in cramped quarters.

Power Scoop for Loose Material

A new power scoop designed to handle loose material, such as sand, gravel, fertilizer, bulk cement, clay and soft coal, will do the work of ten to fifteen shovel and barrow men in

less time, according to its manufacturers, the Clark Tructractor Co., of Battle Creek, Mich.

The standard bucket holds 9 cu.ft., or 1,500 lb., though larger sizes may be had for materials lighter than sand. Two models are provided, one having an under-bucket clearance, with bucket in dumping position, of 3 ft. 9 in., and the other, a clearance of 6 ft. 5 in.

A UNIVERSAL TRUCK CRANE *to complete 1930 jobs* ON TIME!

Travels to the job at motor truck speed —always loaded and ready to go.

Does 101 different jobs cheaper than a big machine—quicker than hand labor.

Motor Truck (Christie) Crawler combines crawler traction and motor truck speed with reduction of wheel loads.

Universal 35, ½ yd. machine mounted on 2-Speed Center Drive Crawler.

WITHIN REACH of practically every contract, there is a Universal Truck Crane, loaded and ready to go, ready to help finish this year's job on time. For short service you can rent one of these machines, complete with skilled operator from any of the Universal Crane Service Companies. Or you can buy one outright for permanent service, obtaining in one investment a single machine that can

Unload cars	Drive piles
Charge bins	Handle batch boxes
Grade roads	Place pipe
Dig ditches	Remove slides
Load trucks	Dig gravel
Build culverts	Dig Bridge abutments
Build berms	Erect steel

or any of the odd clean-up jobs that can't be handled quickly or profitably by big machines.

If you have never seen one work, write us and we'll tell you where you can see an actual on-the-job demonstration.

THE UNIVERSAL CRANE COMPANY
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Also builders of the Universal 35—¾ yd. shovel—5 to 7 ton crane.

UNIVERSAL

Keep your Big Shovel for *Big Shovel Jobs* ▲ ▲ ▲

—and let a small shovel—Byers Model 40—earn the profit you deserve on small or short-time jobs. Then each of your machines will pay for itself the way you want it to. Half or ¾ yd. full circle rigs on very light excavations are expensive. In crowded quarters their bulk and tail swing make operations slow, clumsy—and costly.

Live weight not exceeding 10 tons complete allows Byers Model 40 to fit in and handle economically the countless small jobs which every engineer and contractor continually run up against.

Here's a rig that's built with all the construction and operating features found in finest 1 yd. shovels. On bank work or grading, car loading or digging deep footings, trenching or ditching—Byers Model 40 stands up to its job dependably, handling and digging at new low costs. You should learn more about Byers Model 40.

BYERS

RAVENNA · OHIO

"40" · ½ · ¾ · ¼

6 of the trucks in this fleet were on Goodyear Truck Balloons, 4 were on solid tires. Over a five months' period they showed the results below:

75%

more work per day

on Goodyear Truck Balloons

Side by side on the same job, and on the same size and type of truck, Goodyear Truck Balloons made this showing against other tire equipment.

"The length of the haul was two and one half miles. The balloon tired trucks made 14 round trips per day while the solid tired trucks made only 8 round trips per day." 6 more trips per day for the Goodyear Balloons meant 75% more hauling done. But that is not all, as this report from Meyer Rosenberg, San Francisco contractor, shows:

"In the dump we had considerable trouble pulling out of the sand with solid tires but the balloon tires never even faltered — I estimate gasoline consumption to be 15% less on the balloon tired trucks... We had practically no punctures and tread cuts and there was no carcass trouble whatever with the balloon tires... I feel that the cushioning ability of the balloon tires enabled me to eliminate any body repairs during this five months' period . . . Besides all these good features, we are getting from fifteen to twenty months' service from these balloon tires, and this is remarkable in our line of work."

There's a line-up of advantages to make any contractor or builder think twice about his tires!

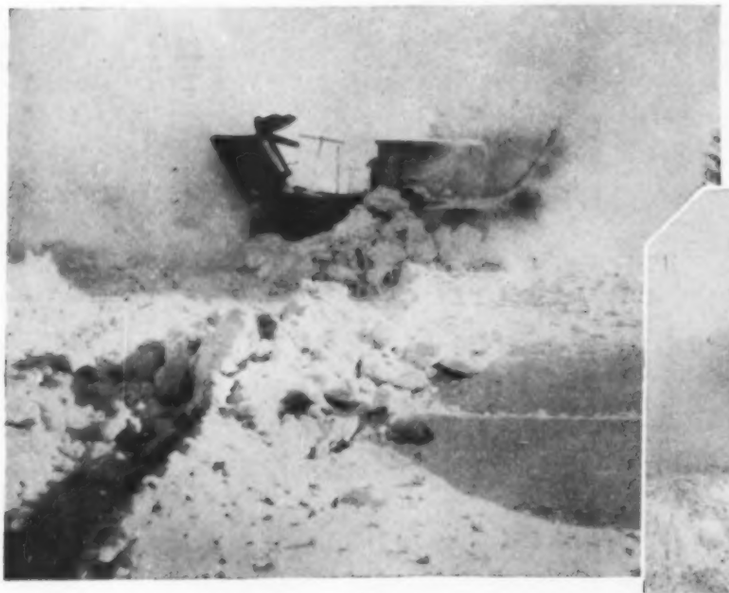
Get in touch with a Goodyear Truck Tire Service Station Dealer, and ask him what these remarkable new truck balloon tires can do for you.

ON YOUR NEW TRUCKS, SPECIFY GOODYEARS

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

When Winter Hurls His Challenge



BE READY!

THERE is no way to evade the issue when Winter strikes! Swiftly and with little warning Winter takes control of city and countryside, paralyzing trade and traffic, threatening lives and property. There's only one way to master the situation—*be prepared with competent, adequate snow fighting equipment.*

For nearly fifteen years Cletrac Crawler Tractors have been the preferred power units for the nation's snow fighting work. Built sturdy and rugged as fine steels and sound design can make them, they are ideal for this gruelling service. They are powered for handling the heaviest types of plows and equipment. Moving along on broad, sure-gripping steel tracks they bring their full power to bear on stubborn banks and smash through seemingly impassable drifts. Many times they have been called on to complete jobs where other tractors simply could not carry on.

Scores of letters every winter from officials testify to Cletrac's unmatched performance in snow clearing. At Hiram, Maine, last winter a Cletrac 40 was purchased for their work. "It did not seem possible," wrote the owner, "that a tractor could plow up such hills in high gear. We have used it against frozen banks, pushing them back for more than a mile. We have timed it and made six miles an hour in heavy snow easy."

Assure yourself and your community of full control over your snow removal problems this winter by selecting Cletrac. There is a distributor near you who will gladly give you the facts—or, if you prefer, write direct for literature.

Cletrac Crawler Tractors

THE CLEVELAND TRACTOR CO.
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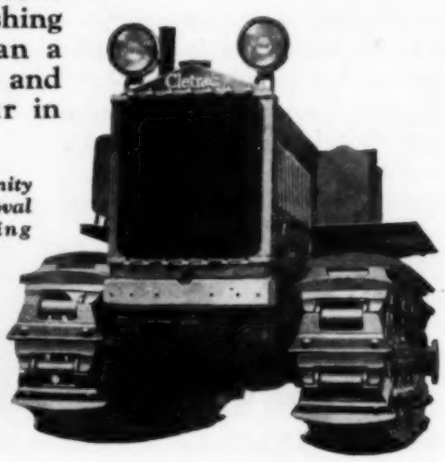
A Complete Line of Heavy Duty Crawler Tractors for Use with Standard Makes of Snow Plows and Snow Fighting Equipment.



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Pavers, Mixers; Power Shovels, Pull Shovels, Cranes, Draglines; Dumptors.

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Excavators; Concrete Placing Equipment, Cars, Buckets, Derricks.

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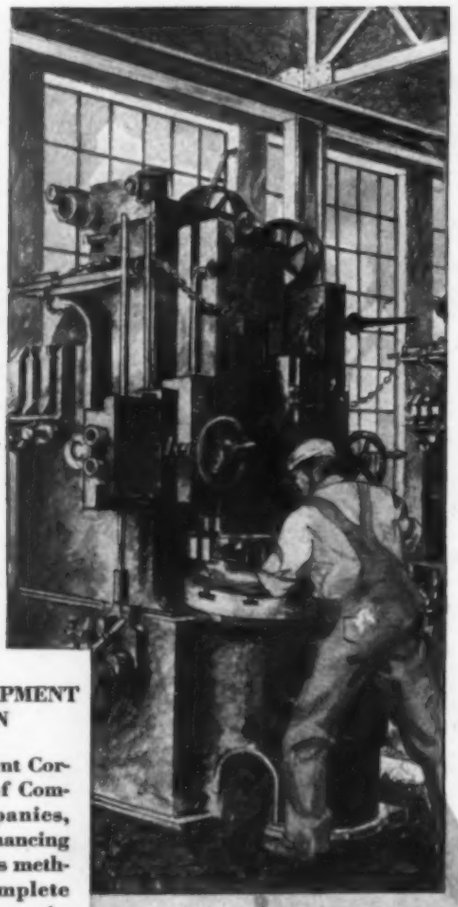

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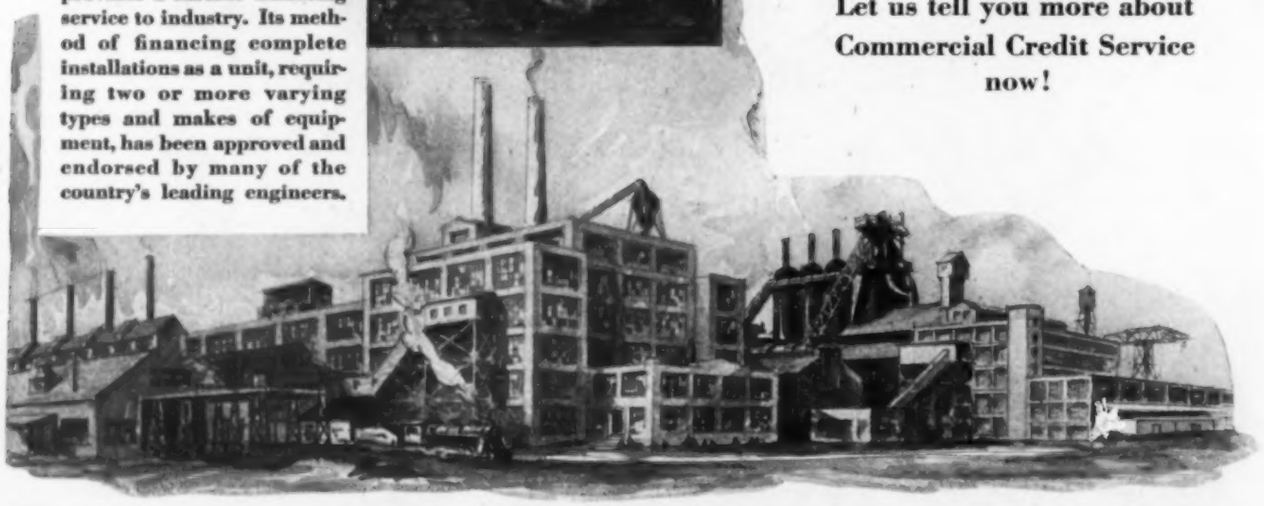

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Centering Gudgeon

An OSGOOD Commander Crane equipped with hookblock for handling large blocks of granite. This OSGOOD is owned by The Arlington Memorial Bridge Commission, Washington, D. C. The crane is used for unloading from trucks and rehandling costly cut granite. "No granite has been damaged as the result of being handled by this crane," writes John L. Nagle, Designing Engineer. "We consider the crane to be sturdy and dependable, and easily operated."

SURPLUS STRENGTH at PIVOT POINT GREATER SAFETY and LONGER LIFE

OSGOODS out-last, out-dig, and out-perform ordinary machines because they're built for long years of continuous trouble-free service and have plenty surplus power and strength for emergencies and tough going. Every vital point is protected from wear and breakage. The centering gudgeon on an OSGOOD assures maximum strength and safety where needed most—it holds the upper body in perfect alignment even though the vertical shaft were entirely removed. No possibility of the upper body sliding off the truck frame at pivot point or misalignment from lateral strains. SIX CYLINDER Gasoline Engine or single Electric Motor for smooth power. You'll want to know more—write TODAY for additional facts.

The centering gudgeon is a heavy elongated hub cast integral with the truck frame which fits into a heavy socket cast on the revolving upper body casting. The gudgeon is bronze bushed and keeps the upper body in perfect alignment with the truck, removing all lateral strains from vertical travel shaft.

THE OSGOOD CO.

MARION OHIO

MASSIVE IN SIZE
GREAT IN STRENGTH
Easy to Handle and Surefooted

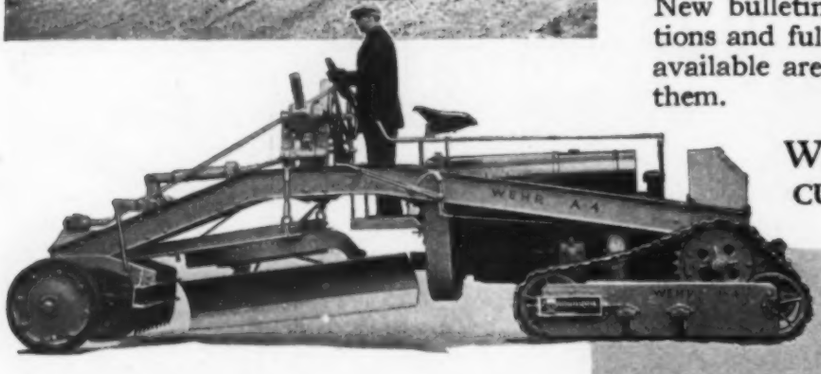
The Wehr "A" Series with your choice of Four Power Plants . . . *the World's most efficient Center Control Grader!*

Never before in the history of power grader construction has there been a center control grader to compare with the new series "A"!

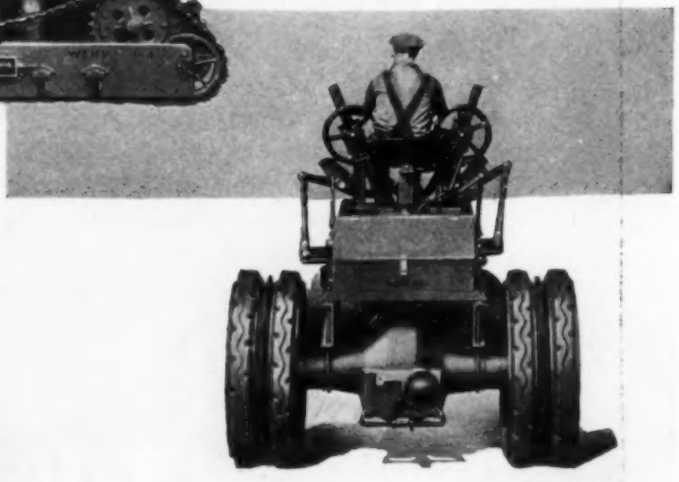
Big, strong, easy to handle and capable of the toughest job—this new series "A" can be supplied with any one of four highly efficient power plants—and, with either Wehr All-Purpose Wheels or Wehr "J" series crawlers.

This new center control job has all the original exclusive Wehr features, plus many new features which are the result of constant research and development by Wehr engineers.

New bulletins containing complete specifications and full data regarding all power plants available are yours upon request. Write for them.

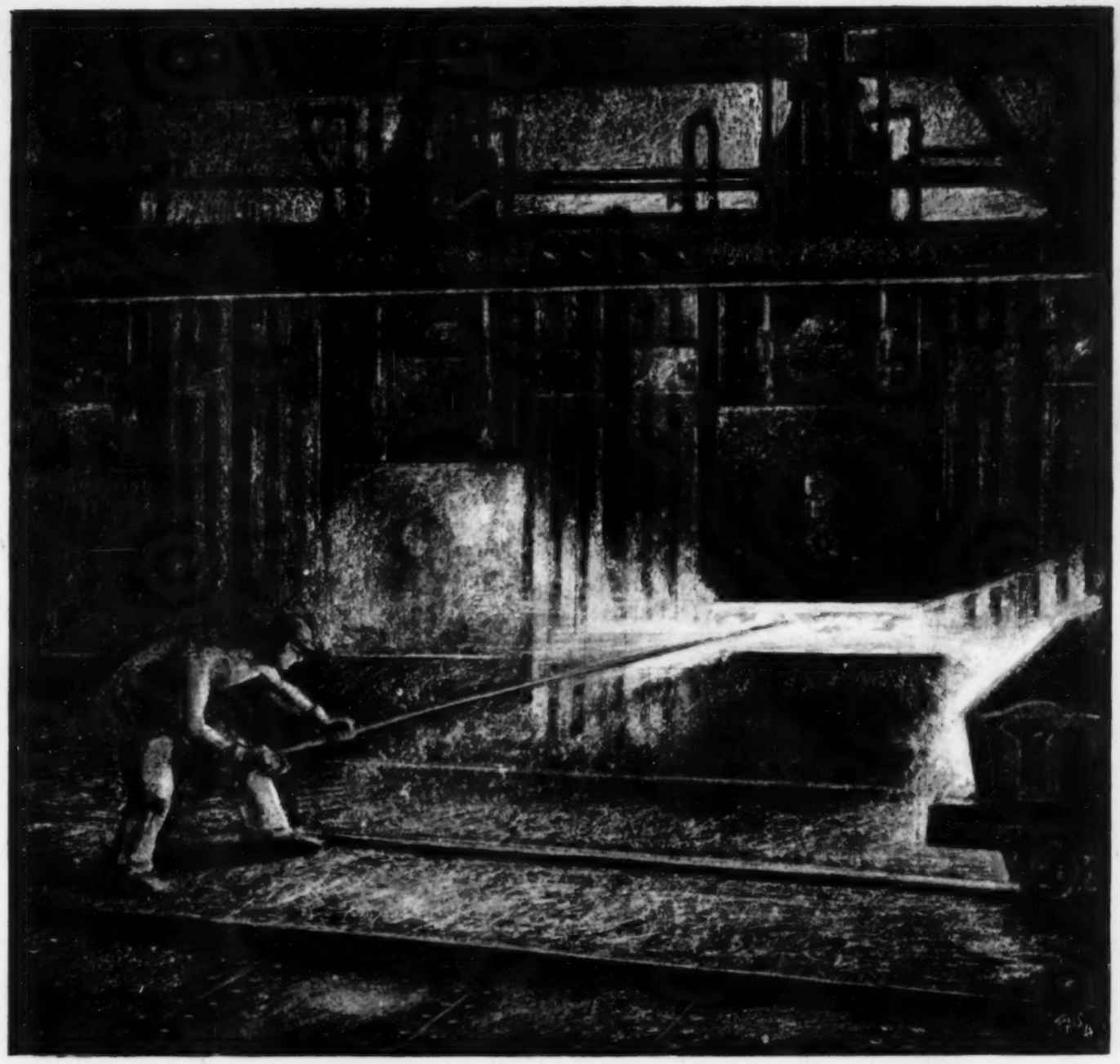


WEHR COMPANY
CUDAHY, WISCONSIN



From every angle, front, side or rear, rugged construction and power to "do the job" are outstandingly apparent. There is no going too rough or job too tough for the Wehr.

WEHR
POWER GRADER



Cooking the *"broth"* this way costs more ... *but see the results!*

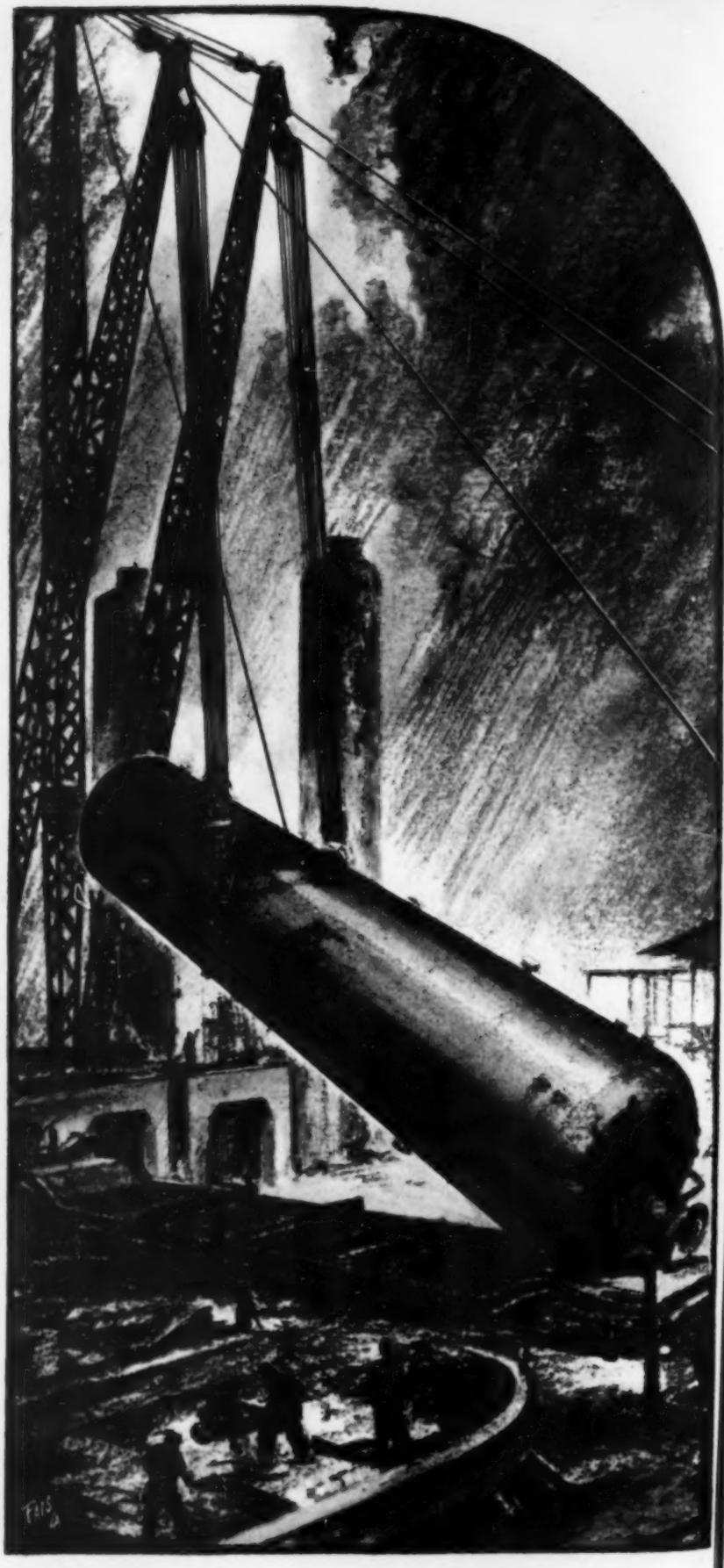
CAREFULLY the "cooks" tend their cauldrons of seething metal. One scans his "broth" with practiced eye... and adds more of this, or of that. Another dips a sample for testing. Each bubbling potful is painstakingly watched, "seasoned", tested ... clear through to the final pouring. Talk to a Roebling steel man and he will tell you that this exceptionally close control of the melt is made possible through using only *small* open-hearth furnaces. That making steel this way costs more... but a consistently higher grade, unvarying product results.

It is this *old-fashioned thoroughness*... coupled with modern production methods... that makes Roebling "Blue Center" Steel Wire Rope what it is!

ROEBLING **WIRE ROPE**

"BLUE CENTER"

Where LOADS *test rope stamina*



CONSTRUCTING a modern petroleum refinery is a job for titans. One after another, great steel towers and chambers, weighing upward of 100 tons, must be set in place on massive concrete foundations. Forty feet long and ten feet O.D., the safe hoisting and placing of these heavy, cumbersome chambers demands rope capable of enduring extraordinary strains and stresses. This led to the choice of Roebling "Blue Center" Steel Wire Rope for the derricks at the Eastern Oil Processing Co. refinery.

Throughout the Roebling Mills, in every operation from "open hearth" to "reel", old-fashioned thoroughness is, and always has been the watchword. It supplements modern methods of production and control, and adds that extra measure of service for which Roebling "Blue Center" Steel Wire Rope is noted.

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Portable Electric Tools

Speed Up the Job!

Use Them to Save Time and Labor

The World-Famous ½-Inch Electric Drill

Designed and built for hard, constant use, the Black & Decker ½-Inch Portable Electric Drill has long been the most widely used electric drill in the world.

Readily portable, weighing only 12½ pounds, yet so powerful that a man cannot stall it—even when drilling in steel at its maximum capacity. Universal Motor. Other drills in sizes from ¼-inch to 1½-inch, with hole saws and other accessories available to extend their usefulness.

Portable Electric Saws do the Work of Six Men

These safe, easily-handled saws will rip six times as fast as hand sawing and crosscut seven times as fast. Ideal for all types of building work, large construction jobs, repair work, etc.

Table adjustable from 0° to 45° for bevel cutting and other special sawing operations. With proper blade will also cut light metal, slate, marble, asbestos, tile, transite and porcelain. Universal Motor. Built in 6-inch, 8-inch and 10-inch sizes, packed in convenient carrying cases.

Drive Screws with Portable Electric Screw Drivers

Powerful Ball-Bearing Electric Tools for driving screws and nuts. Similar in construction to Black & Decker Electric Drills, except that spindle is provided with a positive clutch which releases screw when forward pressure on tool is relieved.

Ideal for driving any wood screws up to No. 16 by 3¼-inch long in hardwood, lag screws up to ⅝-inch by 4-inch long and nuts or bolts up to ¾-inch diameter. Universal Motors. Made in two convenient sizes.

The BLACK & DECKER 1⅛-INCH ELECTRIC HAMMER Quickly Pays for Itself!

IT STRIKES 2900 hard blows per minute continuously . . . and a man can strike only about 50 . . . think of the difference!

That's why this amazingly efficient electric hammer is indispensable for any "hammer-action" job such as driving star drills, steel chisels and wood-working chisels. Drills 1-inch holes in concrete at rate of 3 inches per minute—in brick, 8 inches per minute! Ideal for heavy mortising, bushing, caulking, demolition work, corner chiseling, etc.

Fitted with powerful Universal Motor, operating on A. C. or D. C. and Self-Cooling Barrel. Packed in Fibre Carrying Case. Available in ⅝-inch, 1⅛-inch and 1½-inch capacity sizes.

See them at your Distributor's today.

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Please send me catalogue showing full line of Electric Tools. I am particularly interested in:

Electric Hammers — Electric Drills
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A Light Maintenance Grader

With All Exclusive Features of Heavier Galion E-Z Lift Graders

This new Galion No. 70 E-Z Lift Adjustable Leaning Wheel Grader meets the need for a light, sturdy maintenance grader; it is strong enough and heavy enough for moderate ditching and grading work. Furnished with either horse or tractor equipment. Standard re-inforced moldboard is 7 ft. wide.

All of the exclusive Galion Grader features found in the larger machines are embodied in this new 70. A few of them are: double gear segments and pinions for leaning wheels; Galion patented E-Z Lift Springs; Galion patented Automatic Skew Axles; renewable ball and socket joints on lift controls; cone and socket tightening device connecting moldboard to circle; and special tapered universal joint on steering rod to prevent locking while steering.

In addition to these features this husky little grader is fitted with accurately machine-cut worms and gears enclosed in oil tight, dust proof cases and running at all times in a bath of oil; Alemite lubrication; and Timken tapered roller bearings in the wheels.

The frame is rigidly reinforced at points of greatest stress and strain.

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BULLETIN 330—"WATERPROOFING, DAMPPROOFING AND GENERAL PROTECTIVE COATING"

Write for this Free Booklet

Bulletin 330—28 two-color letter-size pages, illustrated and filled with practical information and data covering conditions which exist on the majority of construction and repair jobs.

To get your copy MAIL THE COUPON

BULLETIN No. 330 tells exactly what every building owner, architect, specifying engineer and contractor should know about important construction requisites, as indicated by the following chapter headings:

Superior characteristics of Headley Emulsified Asphalts as compared to hot-applied, clay-suspended, and solvent "cut-back" asphalts—Correct basis for estimating costs of asphalt coatings—Coating concrete, metal, wood or fabric for resistance to water, acids, alkalies, fumes, etc.— Protection of metal pipe from corrosion—Waterproofing of concrete floors by building in a layer of asphalt—Laying waterproofing membrane—Sealing cracks in concrete—Thin waterproof floor surfaces of asphalt—Dampproofing outside masonry walls above grade; parapet walls, coping, etc.—Dampproofing the inside of existing foundation and building walls—Inside dampproofing and plaster bonding—Outside bonding for stucco—Insulating interior walls of refrigerating rooms—Backing cut stone to prevent stain—Construction of built-up composition roofs—Rejuvenation and maintenance of old coated roofs—General instructions for applying Headley Emulsified Asphalts.

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If the bulletin does not give you a clear understanding of all features, our Service Engineers will submit further information, suggested specifications, and cost figures. Their advice will not obligate you.

Headley Emulsified Asphalts are made by the largest exclusive manufacturers since 1908, of Emulsified Asphalts for Industrial lines.

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★ Self-lubricated axle bearings. « « « « No oiling needed. Wheels easier. « «

★ "V" shaped pressed steel tray braces. Greater rigidity. « « Can't twist. « « « «

Sterling

FEATURES contributing to LOWER OPERATING COSTS

» » thru More loads per man per day. Increased manpower, thru perfect balance. Lowered maintenance, last longer, interchangeable. Raised efficiency, exact sizes. Prompt field delivery. Write for Full Facts!

★ 10-spoke wheel, instead of 8. Smooth flush riveted spokes.

★ "V" braced channel steel legs, riveted. Strength with light weight. « « « « «

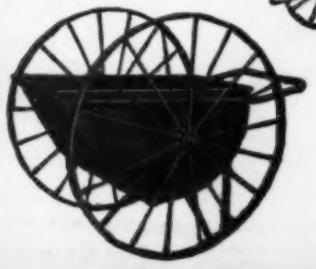
★ Axle keyed to Malleable iron brackets. No nuts to loosen. « « «

★ Malleable iron wheel guards, insure protection, easier dumping.

No. 6A—A. G. C. for dry material. Capacity 3½ cu. ft. All Sterling barrows have reinforced tray tops and corners. This is the most popular general type barrow.

No. 11—Coal and ash type. Capacity 6 cu. ft. or 350 lbs. Easiest wheeling big load barrow made. Built extra strong and rigid for tough work.

No. 10A—Wide tray, capacity 4½ cu. ft. A. G. C. standard. Fits all contracting requirements and built to give the longest service. Solid and strong



No. 6—The strongest built cart on the market. Full capacity body, no axle inside. Capacity 6 cu. ft. or 1200 lbs. Perfect balance and easiest wheeling. 42" wheels.

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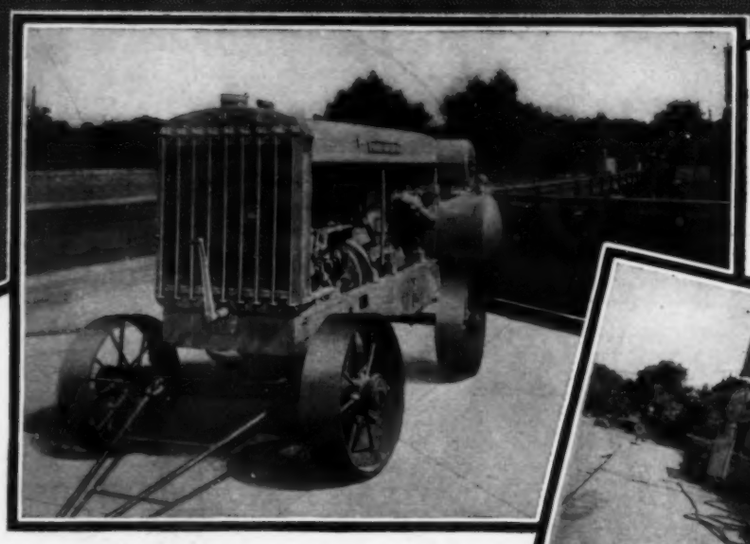
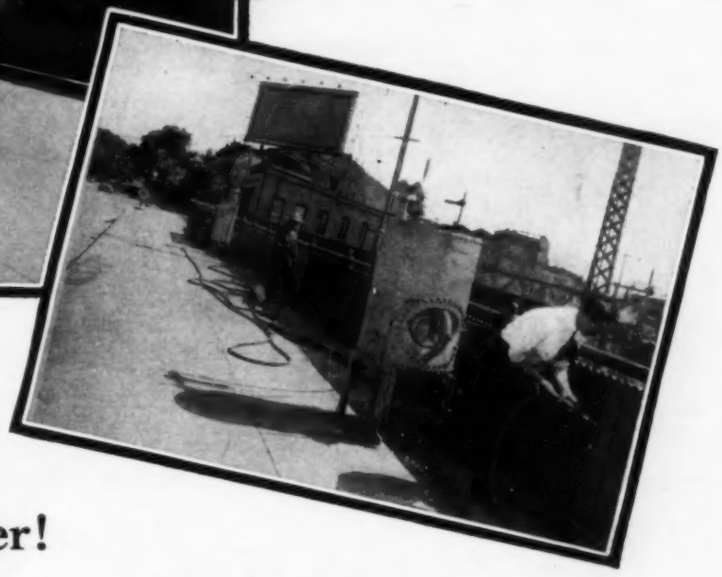
SPEEDING UP A SAND-BLASTING JOB WITH THE "AIR KING" PORTABLE





"AIR KING" Reliability Insures Satisfactory Results And A Profit To The User!

Sand blasting demands a steady, uniform source of air pressure. The United Painting Contracting Company of Trenton—in their work on this Pennsylvania Railroad bridge in Philadelphia—used their portable "AIR KING" Compressor to maintain a continuously uniform pressure in their two sand-blasting machines. This company, specializing in bridges, is one of the leading firms of its kind in the East. They are highly enthusiastic over the results obtained with their "AIR KING".

After the old paint is removed, the "AIR KING" may also be used to operate the paint spraying equipment. A reliable compressor is a vital necessity in contracting work, for jobs are taken at contract prices and must be completed in schedule time in order to make a profit.

"AIR KINGS"—ranging in size from 28 cu. ft. to 330 cu. ft. displacements—are saving time, labor and expense every hour of the day in the operation of rock drills, paving breakers, tie tampers, clay diggers, riveting and chipping hammers, sand blast and paint spray equipment and many other pneumatic tools.

Complete catalog on request.

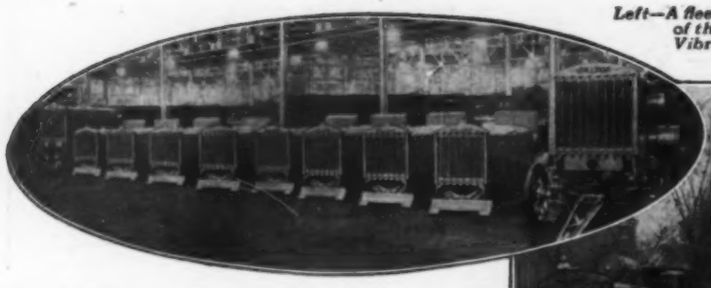
METALWELD, Inc., 26th and Hunting Park Ave., Philadelphia, Pa.

Dealers in principal cities

METALWELD-WORTHINGTON

PORTABLE AIR COMPRESSORS

Left—A fleet of Sullivan Vibrationless Compressors waiting delivery to one of the largest gas companies in the world. Below—A fleet of Sullivan Vibrationless Compressors owned by Washington, D. C



Is there a difference in compressors?

Big Users of air answer with fleets of Sullivan Vibrationless Compressors

Every contractor knows that a compressor which stays on the job to the finish will earn him many extra dollars. . . .by increasing the output of tools and men, and by reducing overhead.

But multiply these dollars by. . .four! . . . five! . .six! . . . ten! Double them again for the jobs which are carried on night and day! . . . . and you have the reason why the buyers of compressor fleets are specifying *Vibrationless* Compressors. Catalog 83-R.

Prices on Sullivan Gasoline-Driven Portable Compressors, on Steel Wheels.
(Prices on skid, truck mounting and highway trailer trucks on request)

Prices include freight to nearest railroad depot	CAPACITY COMPRESSOR				
	66-ft.	110-ft.	160-ft.	220-ft.	310-ft.
Price, east of Mississippi	1065.00	1670.00	2485.00	2840.00	3550.00
Price, west of Mississippi	1095.00	1715.00	2560.00	2910.00	3645.00
Add for rubber tires	80.00	80.00	125.00	125.00	175.00
Add for spring mtg	395.00	360.00	530.00	570.00	900.00
Deduct for omitting running gear	25.00	60.00	80.00	80.00	80.00

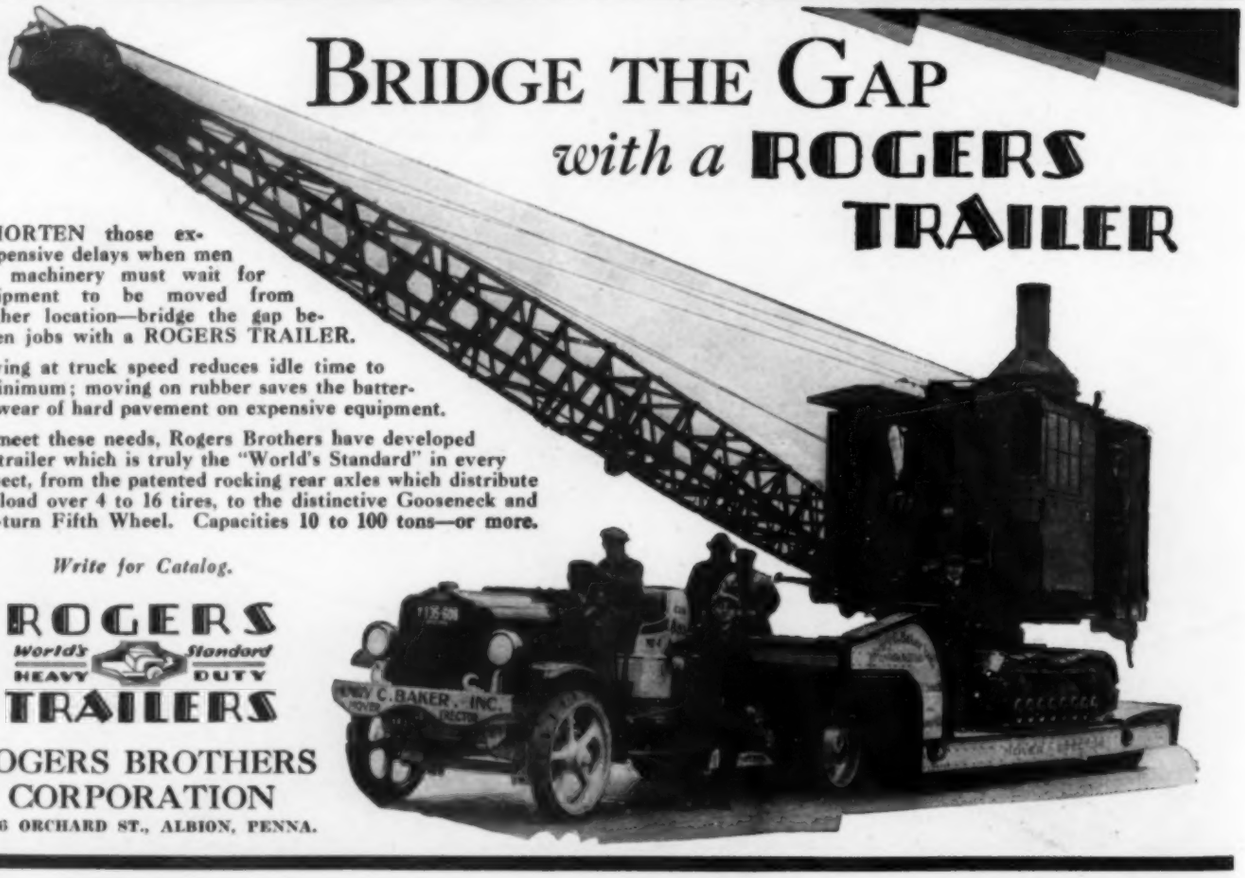
SULLIVAN MACHINERY COMPANY
816 Wrigley Bldg., Chicago

Right-A fleet of Sullivan Vibrationless Compressors on a tunnel job in Maine.

Right—A fleet of Sullivan Vibrationless Compressors owned by a large city in Wisconsin.

Right—A fleet of Sullivan Vibrationless Compressors on a rock job in New York.

BRIDGE THE GAP *with a* ROGERS TRAILER



SHORTEN those expensive delays when men and machinery must wait for equipment to be moved from another location—bridge the gap between jobs with a ROGERS TRAILER.

Moving at truck speed reduces idle time to a minimum; moving on rubber saves the battering wear of hard pavement on expensive equipment.

To meet these needs, Rogers Brothers have developed the trailer which is truly the "World's Standard" in every respect, from the patented rocking rear axles which distribute the load over 4 to 16 tires, to the distinctive Gooseneck and full-turn Fifth Wheel. Capacities 10 to 100 tons—or more.

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SWING – CRANE

Plus 160 cu. ft. capacity air-compressor!
A COMPACT, STURDY, MOBILE COMBINATION— ABLE TO COPE WITH A MULTITUDE OF JOBS
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Traditions

Quality Engineering

The AMERICAN
Gopher has
Fewer Parts
Lower Center of
Gravity, Less Weight
Greater Stability

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minnesota

A Dobbie Winch For Every Purpose

From 100 to 50,000 Pounds on a Single Line With Ease and Safety

Large Stock to Choose From

Dobbie Motorized Winches

Sizes 500 to 3000 pounds on a Single Line

DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.
Complete Stock Carried at Niagara Falls and New York City
Timber Derrick Fittings—Sheaves—
Hand-Winches—Blocks
Write for prices, Dobbie all steel Derricks and Rotating Derricks.

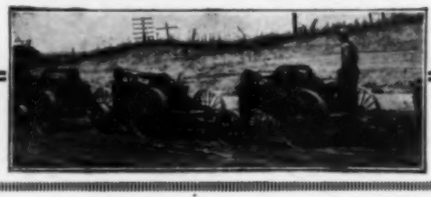
Contractors and Road Officials Write for Catalogue No. 280

It tells all about

Baker Maney Self-loading Scrapers.
Baker One-man Rotary Scrapers
Baker Bulldozers and Backfillers.
Baker Road Maintainers and Planers.
Baker Snow Plows for Trucks and Tractors.

BAKER
TRACTOR EQUIPMENT
EARTH MOVING-ROAD MAINTENANCE-SNOW REMOVAL

The Baker Manufacturing Co.
568 Stanford Ave, Springfield, Ill.



Ransome 135 ft.

HEAVY TYPE
Steel Mast Plant
Speeding up a Cincinnati School Job

THE Ransome Heavy Type Steel Mast can be used with any of the three most commonly used concrete chuting plants (Counter-weight Boom Chute Plant, Continuous Line Plant and the Bin Plant) or in a combination of two or more of them. The mast sections are 22½ feet long and of channel and angle construction. Easy to handle —unusually strong. Method of erecting is safe, easy, fast, economical. Light weight, unit type construction, Ransome Chutes offer many advantages in erection and operation of plant. A sliding frame permitting quick change of elevation of the chutes or bin, is standard equipment on all plants.

For complete story of this labor and time saving plant, send for Bulletin 304

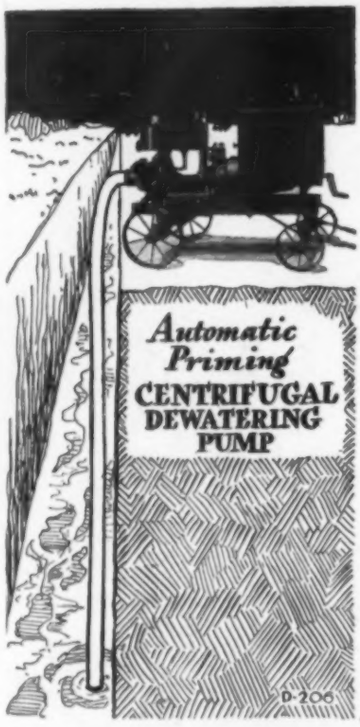
W. H. Dunkin & Sons, Contractors are using this plant in pouring concrete for the Oyer School, Cincinnati, Ohio.

Ransome Concrete Machinery Company

1850 — Service for 80 Years — 1930

Dunellen **New Jersey**

A BOON TO CONTRACTORS



"DOMESTIC" Self-Priming CENTRIFUGAL PUMP UNITS

Popular Sizes: 2½ in., 3 in., 4 in., and 6 in.

Capacities: 200 up to 1400 G.P.M.

Suction Lifts: Up to a maximum of 27 ft.

Priming—Just submerge suction line—*no tanks to fill with water*—pump primes from a dry start.

Full Ball Bearings, Extra Large Shafts and Trash Handling Impellers.

Pierce Steel Pile Corp. write: "We have used one of your Self-Priming Centrifugal Pumps on our Philadelphia job 3 months, running it 24 hours daily without a shut down and it is still O.K."

No. 2½ Unit $340—No. 3 Unit $600.
F. O. B. Shippensburg, Pa.

DOMESTIC ENGINE & PUMP CO. — *Manufacturers* — Shippensburg, Pa.
Distributors in principal cities throughout the U. S. A.

For the Asking

Pumping Handbook

Year after year this Novo Pumping Handbook is brought up-to-date to meet the requests of thousands of contractors, who are finding it a valuable aid in lowering their water handling costs. Consisting of a collection of pumping jobs from all over the country—on all types of work—detailed by pictures, facts and figures—the booklet can show you the way to better, cheaper pumping methods. Send the coupon today—no obligation.

NOVO ENGINE COMPANY
214 Porter Street—Lansing, Mich.
Clarence E. Bement
Vice-Pres. & Gen. Mgr.

PUMPS—ENGINES—HOISTS
NOVO

Please send me the Novo Pumping Handbook.

Name.....
Address.....
City.....State.....

DIXONS

DIRTPROOF AND STEAM PROOF TOO..FOR JOBS LIKE THIS

Are you protecting the life of your costly equipment by keeping dirt, water, steam, etc., out of the bearings? You will be glad to know that you can—with Dixon's Waterproof Graphite Grease. This lubricant has flake graphite as the vital, wear-resisting element combined with high-grade lubricating stock—double insurance of better lubrication.

Use Dixon's Waterproof Graphite Grease on chains, wire ropes, gears, heavy bearings, etc., especially where exposed to the weather or difficult operating conditions. Get acquainted with this unusual lubricant and you will find out the wisdom of using it regularly. Write for Circular No. 86-W.

Joseph Dixon Crucible Co.
Established 1827

Jersey City D X N New Jersey

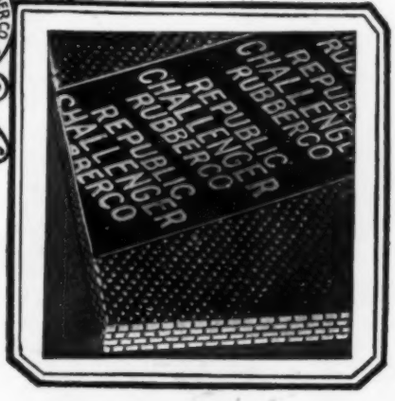
TALK NUMBER ELEVEN BY A PROMINENT DISTRIBUTOR

"We Are a Factor in . . .
Community Prosperity

Above—Mr. C. J. O'Neill, President of the O'Neill-McNamara Hardware Company of Vicksburg, Mississippi. This company's services are of a definite economic value to the prosperity of its business territory.

Therefore—a direct asset to every consumer in this territory. Our value to our territory depends entirely upon its prosperity and its support. If we recognize and meet our obligations to those within our natural boundaries—then—we earn our right to existence in preference to any direct competition. We recommend Republic's Belting—Hose—Packing—Molded and Lathe Cut Goods."

The above statement is characteristic of those made by prominent distributors all over the country. It explains in part how the Industrial Supply Distributor, helping to solve the important problem of broad markets and economical distribution, upholds high quality, maintains fair prices and saves needless efforts on the part of both consumer and manufacturer.



Challenger Transmission Belting—a square edged belt without seams to open up—with body sufficient to hold belt fasteners—with very little stretch and a gripping power that reduces power losses caused by slippage.

Recommended for heavy or troublesome drives.

Write for a sample

THE REPUBLIC RUBBER CO.

Youngstown
Ohio

REPUBLIC means the Best Mechanical Rubber Goods

SCHRAMM—at the "crossroad of the world"

STREET repair work at 42nd and Broadway, New York City requires the most efficient equipment obtainable. The job must be done quickly,—day and night labor is necessary.

A SCHRAMM No. 120 Air Compressor was depended upon to supply air for the paving breakers. The job *was* done in record time, in the midst of heavy traffic. No unnecessary delay at the "crossroad of the world." Depend on SCHRAMM for air.

A complete assortment of portable or stationary mountings in sizes from 1 to 360 cu.ft. displacement. *We will be glad to send the catalog.*

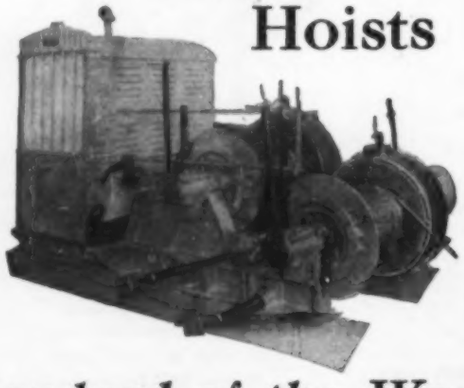
SCHRAMM No. 120 Compressor at 42nd Street and Broadway, New York City

Schramm

SCHRAMM, INC.
West Chester, Pa.

Branches and representatives in all important cities.

Mundy Hoists



Standard of the World

Gasoline—Electric—Steam Derricks

Car Pullers—Cableways

J. S. Mundy Hoisting Engine Co.
722 Frelinghuysen Ave., Newark, N. J.

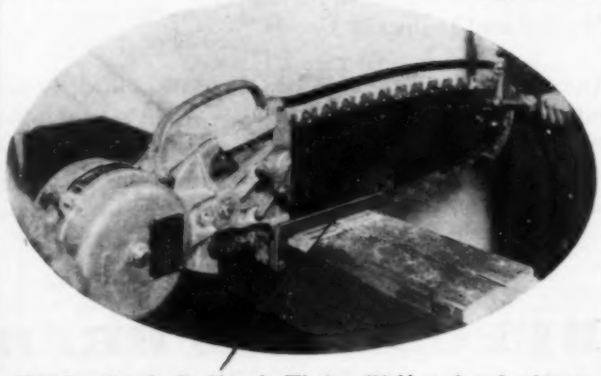
TRADE MARK
MUNDY
ESTABLISHED 1869

Export Office, 30 Church Street, New York City
Cable Address: BROSITES

Notching—

still another use for

The Timber Wolf
Portable Sawing Machine



Showing the A. C. Electric Timber Wolf equipped with an adjustable gauge for notching, as in trestle work, bridge timbers, etc. A series of cuts are taken and then broken out with a chisel. On every timber sawing job, this fast, powerful machine cuts labor costs to a fraction. A.C. and D.C. Electric or Air Driven. Also the NEW Gasoline Driven Saw! Write for further information.

REED-PRENTICE CORP.
Worcester, Mass. *Agents in Principal Cities*

THE LINN ON GREAT ENGINEERING PROJECTS....

One of a fleet of four Linns purchased by the Phoenix Utility Company for construction work on the Ariel hydro-electric project. The Ariel Dam on Lewis River, Washington, will be 200 feet high and 1,295 feet long. The Linns on this job are equipped with high speed reverse.

WHEN THE GOING IS TOUGH ... THEY BANK ON THE LINN

Construction work on a mountain dam puts hauling equipment to every test. That's why the contractors chose Linns to move the dirt for the Ariel Dam in the State of Washington.

They have the traction, the power and the stamina to keep going under difficult and severe conditions. The flexible traction grips and keeps going in soft holes or gumbo that would paralyze the operation of a truck. With power to spare, and with a sure-footed traction that grips every inequality of rock surfaces, the Linn surmounts with ease the steepest grades.

On work like the Ariel Dam, time and money is saved by the high speed reverse which enables the Linn to go in and out of one way passes without a turn.

Statistical evidence—certified surveys of Linn cost per ton performance on difficult hauling jobs are yours for the asking. They show the reason for the growing dependence upon Linn in many industries.

Only The Linn Offers You All These Advantages

1. Patented Flexible Traction that grips any surface under all weather conditions.
2. Tremendous hauling power —100 horsepower to take full advantage of Linn Traction.
3. Ten ton capacity on its own chassis.
4. Extra traction and power for additional tow loads.
5. Easy on men—steers like a truck.
6. Four speeds forward with four speeds reverse optional.

LINN MANUFACTURING CORPORATION

Division of LaFRANCE-REPUBLIC Corporation

Manufacturers of American La-France Trucks, Linn Tractors, Republic Trucks

Factories: Alma, Mich. • Morris, New York

Represented in:

New York City	Boston	Philadelphia	Chicago	Tulsa, Okla.	Salt Lake City	San Francisco
Skowhegan, Maine	Charlotte, N. C.	Pittsburgh	St. Louis	Omaha, Nebr.	Denver	Portland, Ore.
New Haven, Conn.	Memphis, Tenn.	Louisville, Ky.	Kansas City, Mo.	Sioux Falls, S. D.	Jerome, Ariz.	Spokane
Baltimore	Johnson City, Tenn.	Detroit	Little Rock, Ark.	St. Paul, Minn.	Los Angeles	

105 direct distributors located throughout the United States and 49 distributors located in 30 foreign countries

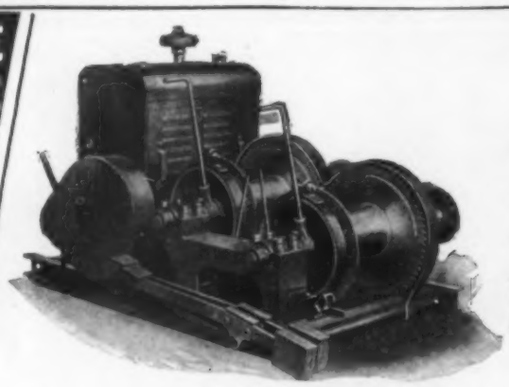
Canadian Linn Distributors: Mussens Limited, Montreal

LA FRANCE REPUBLIC LINN TRACTORS

Patent No. 1,270,531
Patent No. 1,521,464
Patent No. 1,606,641
Patent No. 1,685,976
Patent No. 1,701,979
Other Patents Pending

HOISTS BUILT ESPECIALLY FOR CONTRACTORS

DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE



Dake for Stamina

Taut muscles, sweating shoulders, the swish and creak of straining oars, the finish line—and stamina, the power to endure hard work wins another boat race.

STAMINA, so vital where there's work to be done, is conspicuously present in every DAKE HOIST.

Arc-Welded steel frames, steel cable drums, extra horsepower per pound of weight, and a large amount of stamina—these DAKE HOIST qualities are making added profits for up-to-the-minute contractors.

Send today for the new DAKE catalog. Learn for yourself the superior money saving features of this splendid line of Hoists built especially for contractors, with gasoline or electric drive and ranging from 2 to 27 hp. Priced from $250.00 to $1,900.00 f.o.b. factory.

DAKE ENGINE COMPANY
Grand Haven Michigan

DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE DAKE

Then they DUG it—

with the new
WILLIAMS
"Champion!"

TOO hard for their bucket to dig—so they got a new WILLIAMS "Champion," and went right through it.

When you have digging that's too hard for your clamshell, get a new WILLIAMS "Champion."

Definitely guaranteed to outdig any other bucket.

Make your own tests and comparisons. Write us—we'll make the arrangements.

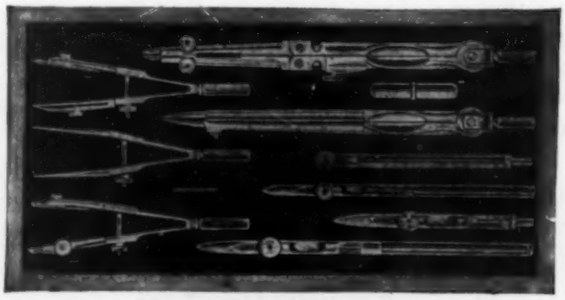
G. H. WILLIAMS COMPANY
607 Haybarger Lane, Erie, Pa.
Branch Offices: New York, Pittsburgh, Chicago

WILLIAMS
BUCKETS—TRAILERS

218

Soellner Drawing Instruments

Are very attractive in appearance and of superior workmanship throughout.



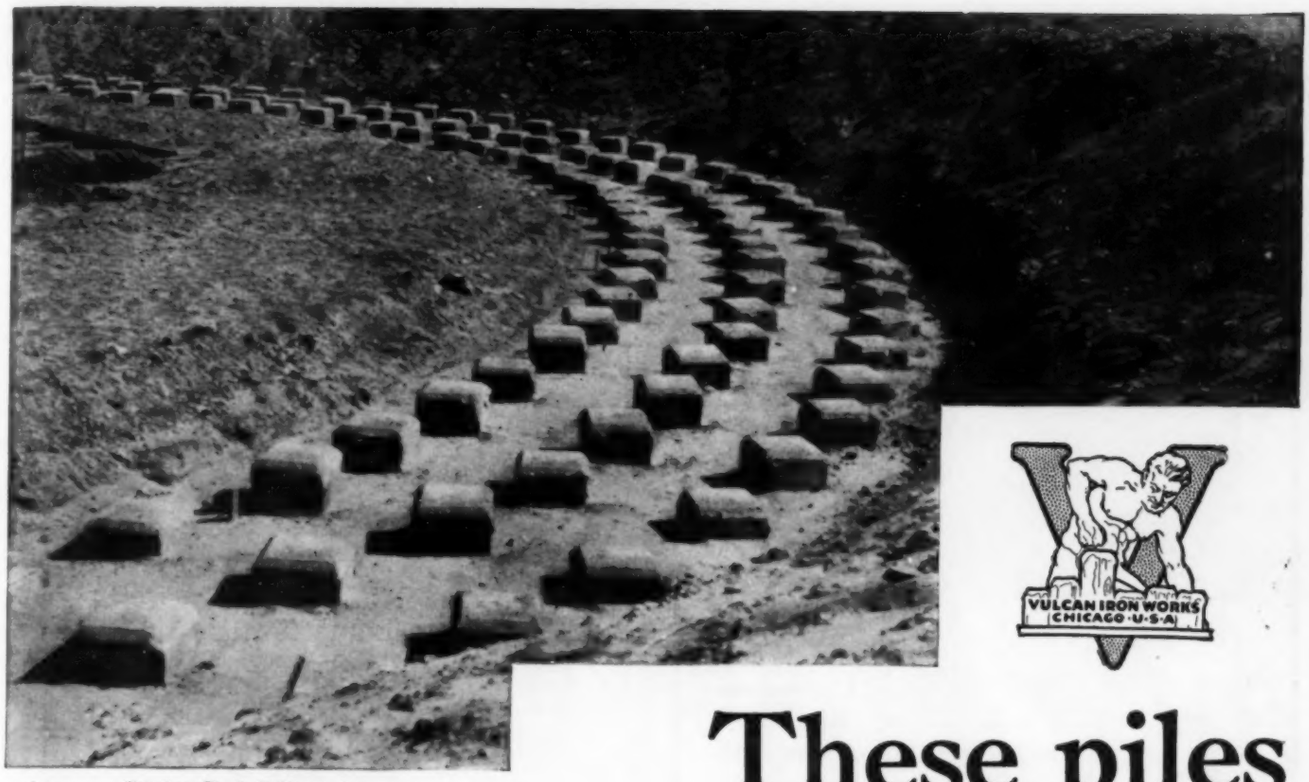
Set No. 1894

This splendid set of Drawing Instruments is made of rolled German Silver and best English Steel.

It Contains
3—3½" Bows
2—Ruling Pens
1—6" Compass with attachments
1—6" Divider—

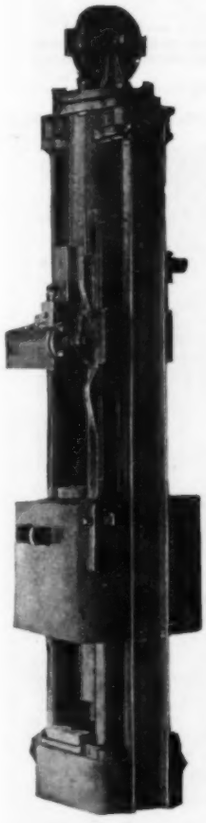
Complete, in velvet lined case, postage paid. **$6**

KOLESCH & COMPANY
138 Fulton Street, New York
Established 1885



Courtesy E. A. Whitney & Son

These piles were punched down



The Vulcan Pile Extractor is built solely for the job of pulling piles. It is the only machine of its kind and has "made good" everywhere in pulling the longest, heaviest, and most difficult wood and sheet piling.

The above piles were driven by real *punching* action such as Warrington-Vulcan Pile Hammers alone embody. Notice the excellent condition of the pile heads on the above job.

Every Warrington-Vulcan Pile Hammer incorporates in its design this true *punching* action. It is the scientific application of driving energy which sinks the piling in the soil rapidly without waste of work and with the least wear and tear on either the piling or the hammer.

It is far different from merely pounding piles down.

On the outstanding jobs from coast to coast for years, Warrington-Vulcan Pile Hammers have been one of the greatest aids to the contractors in speeding and simplifying the work.

Their design is staunch and correctly engineered, and no Warrington-Vulcan Pile Hammer has ever yet entirely worn out although some are still in service which were built years ago.

Send for free catalog of pile hammers and pile driving parts and materials.

VULCAN IRON WORKS

327 No. Irving Avenue, Chicago, Illinois

Southern Representatives:
Woodward, Wight & Co., Ltd., 451 Howard Avenue, New Orleans, La.
Representatives for California, Nevada and Japan:
Harron, Rickard & McCone Co., 1600 Bryant Street, San Francisco, Calif.
Representatives for the State of Washington:
A. H. Cox & Co., Inc., 1757 First Avenue, S., Seattle, Wash.

Warrington-Vulcan

THAT DUST SAYS POWER

"By Yimminy, I never seen a hole blower like dat!" was the remark of one drill runner as he stooped to pick up his hat after blowing a hole with a Cleveland H7 Sinker.

But that's only one advantage of the H7. It drills through hard rock, reinforced concrete or what have you, with a minimum of effort and with a minimum of air consumption.

Unusual power distinguishes the H7. Pick out a tough job and let us show you what it can do.

The CLEVELAND
ROCK DRILL COMPANY
3734 E. 78th St., Cleveland, Ohio

THE H6

All the attributes—power, speed, stamina—of a heavy drill combined, successfully, for the first time in a light tool. H6 weighs only 32 lbs. and is unsurpassed for pop-holing and other drilling to 8 feet or more.

CLEVELAND ROCK DRILLS

If interested in

Hoists,
Derricks,
Cableways

or special equipment write for this book

"Your Own Success"

Good tools and good equipment are essential to success. Lidgerwood machines have success built in them.

Lidgerwood Manufacturing Company

ELIZABETH, NEW JERSEY

Hoist and Derrick Headquarters
for 57 years.

Prevent Concrete Failures by Making Tests of Your Concrete and Concrete Aggregates

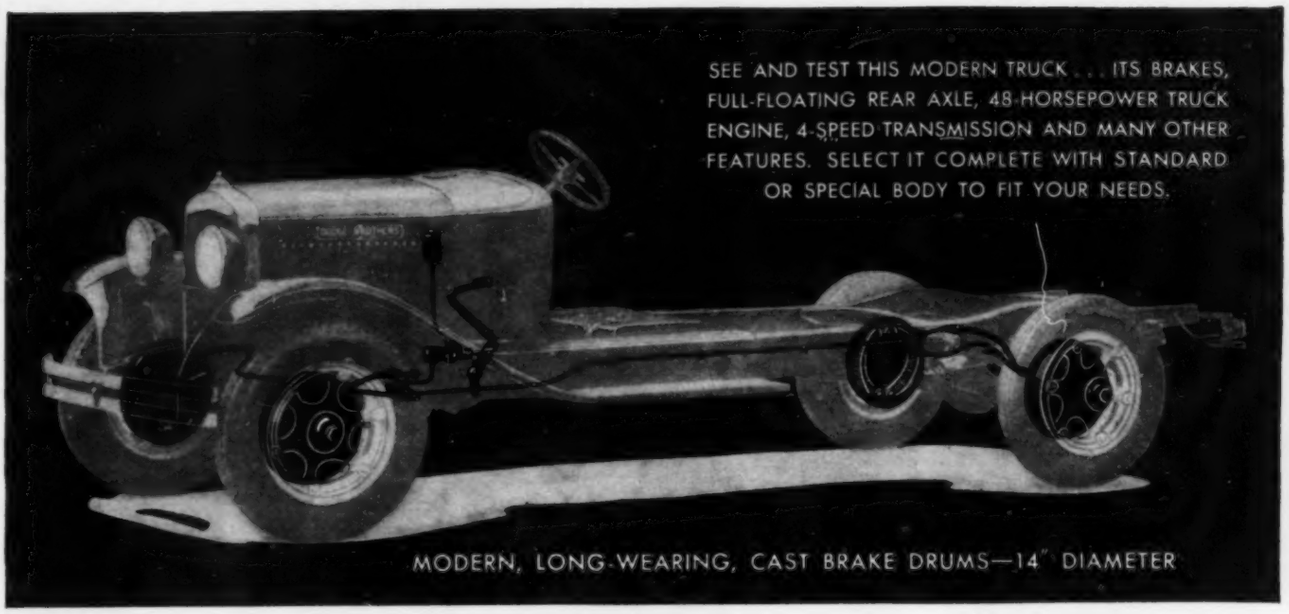
Frequent compression tests are not only now required on all large contracts, but are absolutely essential from a standpoint of safety.

The illustration shows one of our 100-ton hydraulic presses arranged especially to test concrete test cubes, cement, stone, etc.

When it is desired to check and calibrate the gauge load readings, a variable pressure accumulator (of known increments) is furnished.

Write for Bulletin B-18X

THE WATSON-STILLMAN CO.
1014 Evening Post Bldg., New York City


SEE AND TEST THIS MODERN TRUCK . . . ITS BRAKES, FULL-FLOATING REAR AXLE, 48-HORSEPOWER TRUCK ENGINE, 4-SPEED TRANSMISSION AND MANY OTHER FEATURES. SELECT IT COMPLETE WITH STANDARD OR SPECIAL BODY TO FIT YOUR NEEDS.
MODERN, LONG-WEARING, CAST BRAKE DRUMS—14" DIAMETER

Compare the internal hydraulic brakes on the 1½ ton DODGE TRUCK

THESE SAFE, SURE, EASILY-APPLIED BRAKES ARE INTERNAL-EXPANDING AND THEREFORE WEATHERPROOF . . . THEY ARE SELF-EQUALIZING AND THUS EXERT UNIFORM BRAKING ON ALL WHEELS. THEY ARE LESS COMPLICATED . . . THEY ARE EASY TO ADJUST . . . THEY PROVIDE DEPENDABLE SERVICE THROUGHOUT THE LONG LIFE OF THIS EXCEPTIONAL TRUCK.

$595

CHASSIS F.O.B. DETROIT. DUAL REAR WHEELS AT SLIGHT EXTRA COST

DODGE TRUCKS RANGE IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS

LOCOMOTIVE – TRUCK – CRAWLER CRANES
GAS – STEAM – ELECTRIC

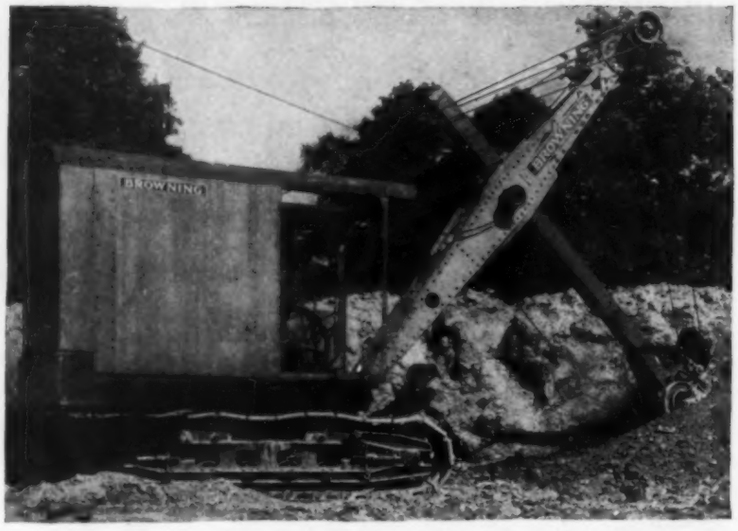
A BROWNING'S speed and ease of handling means more productive work at a lower cost per working day.

A Browning's utility adapts it to *any* kind of a handling job.

And Browning construction means longer serviceability and greater economy in both operation and in upkeep.

Let us show you how a Browning will build greater handling profits for you.

THE BROWNING CRANE CO.
16226 Waterloo Rd., Cleveland, O., U.S.A.
Branch Offices: New York, N. Y., Chicago, Ill.
DISTRIBUTORS:
Birmingham, Portland, Syracuse, San Francisco, Charlotte, N. C., Kansas City, New Orleans, Los Angeles, Indianapolis, Montreal, Toronto, Toledo, O., Albany, Tulsa, Okla., Baltimore, Victoria, B. C., Minneapolis, Tacoma, St. Louis, Pittsburgh



A Browning Type K Shovel stripping overburden at the Green Stone Co.'s Quarry

BROWNING

$169.00 F. O. B. FACTORY on STEEL

$179.50 F. O. B. FACTORY on RUBBER

Saving only *Starts* with the Price

YOU can't beat this genuine Jaeger trailer as a "buy". And it's even harder to beat it on the job, mixing concrete. Contractors say there's a Jaeger 3½S trailer on every street in town. Talk to any man who owns one and you'll know why.

NON-TILTERS 7, 10, 14, 21, 28, 56S sizes. Ask about 1-bag Speed King trailer.

TILTERS—with Skip Shaker loader and Dual-Mix drum. Sizes 3½, 5, 7, 10 ft.

Send for Catalog, Prices, Terms.

THE JAEGER MACHINE CO.
500 Dublin Ave. Columbus, Ohio

Fultex *Waterproofed* TARPAULINS & TENTS

Protection against weather-damage at low cost. "FULTEX" Khaki Waterproofed tents, tarpaulins and windbreaks—serviceable for every purpose—quality at moderate cost. Burlap—in bale or made-up covers—for protecting green concrete.

Makers of famous "SHUREDRY", "DFMP", "USAMP".

Get in touch with your nearest dealer. If he cannot supply you with "FULTEX", write us.

Manufacturers Since 1870

FULTON BAG & COTTON MILLS
ATLANTA · BROOKLYN · DALLAS · ST. LOUIS
MINNEAPOLIS · NEW ORLEANS · KANSAS CITY KAN.

Worn 24 in. Conveyor Belt
BEFORE *repairing with* **COVULC**

The Same Belt **AFTER**
Renewing with **COVULC**

Practical proof of how

COVULC

TRADE MARK REGISTERED

saves thousands of dollars on all conveyor equipment

THE photos opposite *prove* the extraordinary savings COVULC makes on repair and replacement costs of all conveyor equipment—belts, chutes, flumes, hoppers, etc.

The 24-in. belt pictured was practically worn out. A new belt would have cost $670. The actual cost of COVULC to repair it "like new" was $227—a cash saving through COVULC of $443. And this belt was exceptionally badly worn—average repairs for ordinary belts would be much less. We will be glad to send on request, name and full data of the company that made this saving by using COVULC.

COVULC is an entirely new discovery in rubber chemistry—a self-vulcanizing rubber compound which comes in paste form for resurfacing belts—hoppers, agitators, classifiers, etc. Send the coupon below for our descriptive book and find out how you can use COVULC in your plant.

THE HITCHCOCK COMPANY, INC.
48 Pearl Street, BOSTON

New England Distributors:
Bellamy, Robie & Sargent, Inc., 45 Main St., Cambridge, Mass.

Send the coupon

For this descriptive booklet

Name .....

Address .....

CM-11 **THE HITCHCOCK COMPANY, Inc.**
48 Pearl St., Boston, Mass.

MORRIS

CENTRIFUGAL PUMPS

Dredges and Dredging Pumps for standard and heavy duty, lined or unlined, furnished in a wide range of sizes and for any method of drive. Also contractors' pumps, and pumps for sand and gravel, hydraulicking, drainage, sewage disposal, water supply, fire protection, boiler feed, and general service.

Send for bulletins.

MORRIS MACHINE WORKS, BALDWINSVILLE, N. Y.

Branches in principal cities.

Pulling up sand, muck, stones and water with the help of the dependable—

HUMDINGER

SELF-PRIMING
CENTRIFUGAL PUMP

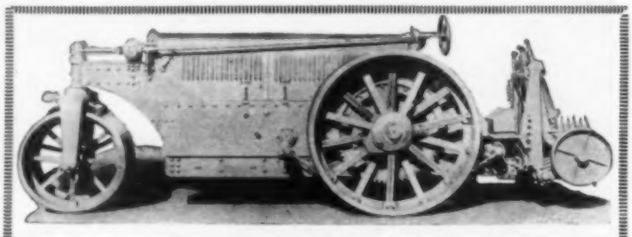
They used a 6-inch Humdinger on the Passaic River job. Five other sizes 100 to 1500 GPM.

A big New Jersey contractor was working on the construction of a sewer station, next to and below the level of the Passaic River. It was a ticklish job. Down there were tons of sand and stones and muck, besides the water—the kind of job that any ordinary pump goes dead on, after the first few snorts. But the Humdinger (a six-inch) went right after it—had it licked in a short time.

Humdinger has a 3-vane chrome alloy impeller, stainless steel shaft —but no priming pumps, no complicated parts. Large air capacity. We gladly supply information on all models.

That's the point about the Humdinger self-priming centrifugal—takes water as it comes to the hose, and handles large quantities of mud and sand besides. Never gets out of order. Costs less.

Ralph B. Carter Co., Hackensack, N. J.



Rugged-Reliable-Modern

That the Buffalo-Springfield Roller really has extra years of service built into it is a fact that becomes readily apparent upon close inspection. Nothing that specialized manufacture considers desirable, or that the most exacting buyer demands is lacking.

Aside from the incorporation of the latest worthwhile features, these rollers are fabricated with strength, ruggedness, and in consequence, with long life ever in mind as a major consideration.

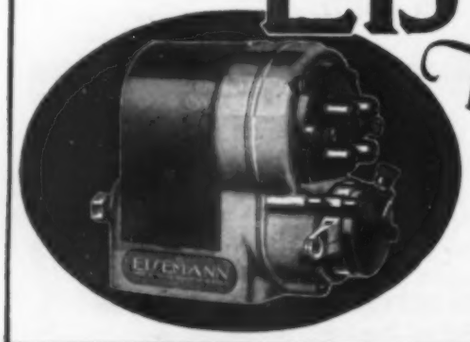
Built in every practical weight and size, both steam and motor driven, three wheel and tandem. Scarifier and other attachments optional.

Write for illustrated booklet.

The Buffalo-Springfield Roller Co.
Springfield, Ohio

Buffalo-Springfield ROLLERS

EISEMANN



The Foremost Magneto
for **SHOVELS, MIXERS**
HOISTS, PUMPS
and all other kinds of
CONSTRUCTION MACHINERY

EISEMANN MAGNETO CORPORATION
60 EAST 42nd STREET, NEW YORK
Detroit - San Francisco - Chicago

TRADITION

"I'M finally convinced, Lad, that now is the time for us to start using arc welding.

I understand that welds produced by a shielded arc are welds that we can stand behind."

PROGRESS

"Right you are, Pop, if we use the Lincoln 'Fleetweld' process. It is the only manual process with a completely shielded arc that produces welds economically.

In this process the shielded arc precludes practically all possibility of oxides and nitrides forming in the weld metal. Consequently welds produced by the Lincoln 'Fleetweld' process have a tensile strength of 60,000 to 75,000 lbs. per square inch—10,000 to 20,000 lbs. stronger than mild rolled steel.

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This test bar of steel plate welded by the Lincoln "Fleetweld" process broke when subjected to pull of 54,000 lbs. per square inch. The weld was machined flush with plate and two .182 in. diameter holes drilled through weld before testing. The stress imposed on the weld was 60,900 lbs. per square inch which stretched the holes to 17/64 in. diameter, an elongation of more than 40%.

Weld made by Lincoln "Fleetweld" process (shielded arc).

Weld made by ordinary arc welding method.

A simple test of the greater ductility of welds made by the Lincoln "Fleetweld" process. Both welds were made on a straight piece of steel plate which was then bent as shown.

W-159

LINCOLN "Stable-Arc" WELDER

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SEARCHLIGHT SECTION

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Of Construction Methods, published monthly at New York, N. Y., for October 1, 1930.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Construction Methods, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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C. H. THOMPSON, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

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[SEAL] H. E. BEIRNE.

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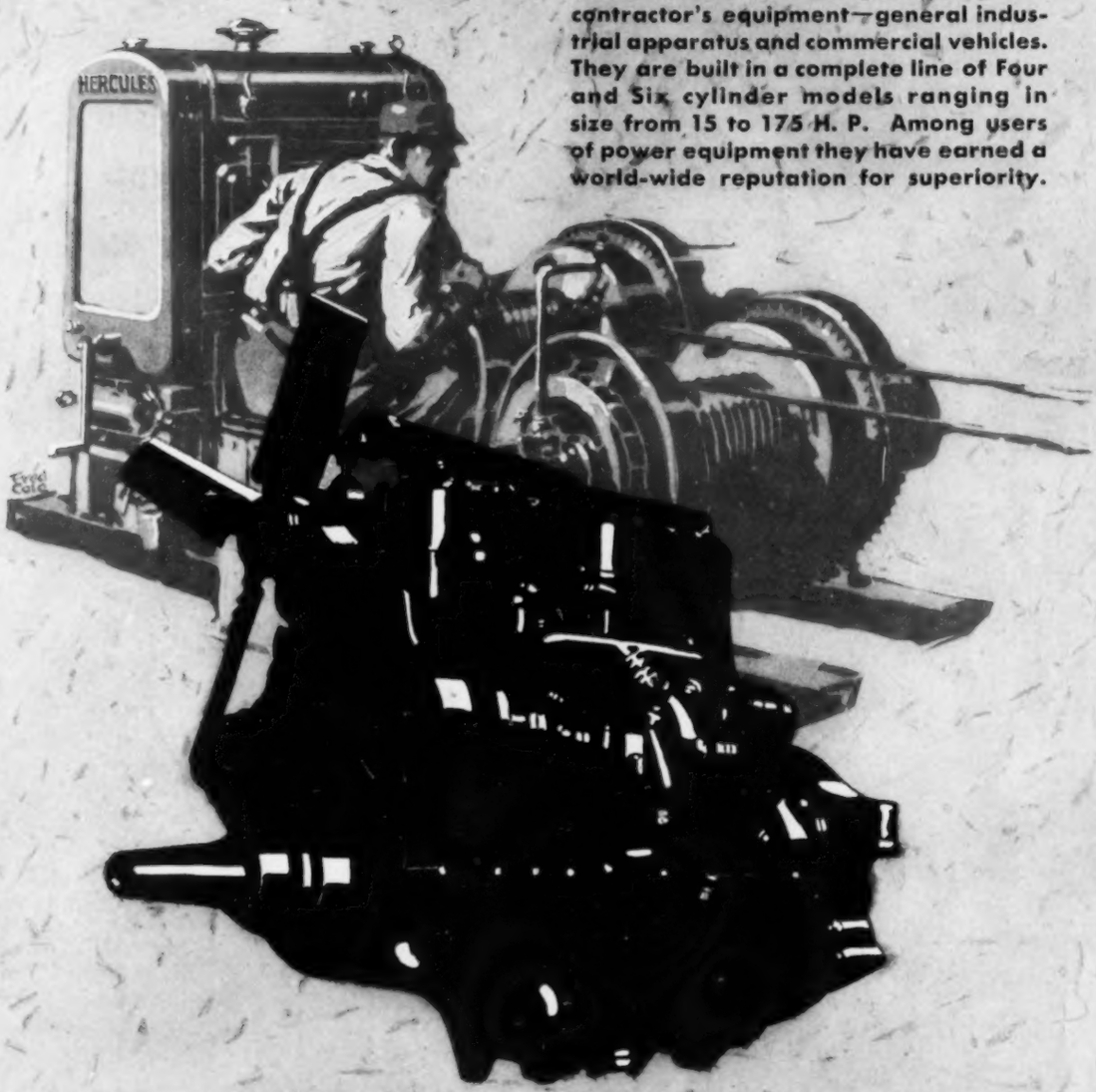

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